PRODUCTIVE COSTS
IN
COTTON SPINNING MILLS

ARTHUR H. HARDMAN

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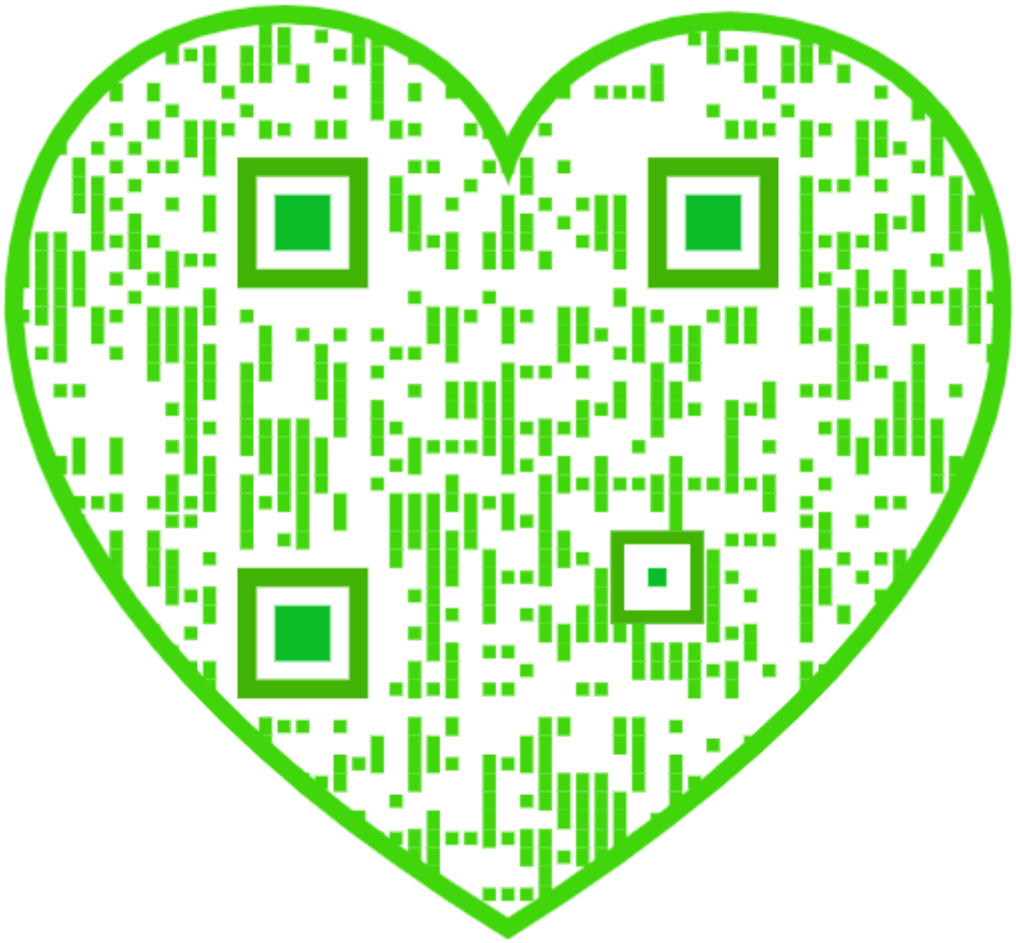

PRODUCTIVE COSTS
IN
COTTON SPINNING MILLS

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MANCHESTER: EMMOTT & CO., LIMITED
65 KING STREET
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in
Cotton Spinning Mills

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MANCHESTER
EMMOTT & CO., LIMITED
65 KING STREET
LONDON: 20 BEDFORD STREET, W.C.
1912
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PREFACE

The greater portion of this book appeared originally as a series of articles in the pages of *The Textile Manufacturer*.

It is an endeavour to evolve, from the divers methods of costing which are practised in the trade to-day, a complete system of cotton yarn costing, which shall on the one side be sound from an accountancy point of view, having its basis in the account books of the concern; and on the other be sufficiently practical to take into consideration all the details and problems of the processes of manufacture, so far as they affect the cost of the product.

The book deals with the principles of the subject which are applicable to all mills, and illustrates their application by numerous examples. In many of the tables and calculations the figures employed are used merely for the purpose of illustration, and though they may be approximately true, must not be taken as actual costs.

A mule spinning mill has been assumed throughout in the examples, though the principles will apply equally well to a ring spinning mill, the difference between them being one of application and not of principle.

This is, so far as I know, the first published attempt to

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deal with the subject of costing in cotton spinning mills in detail. That being so, there will no doubt be differences of opinion as to the value of some of the methods employed. It would be presumptuous to suggest that the book embraces every point of view, and exhausts the subject.

A. H. H.

BOLTON, *January* 1912.

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PRODUCTIVE COSTS
IN
COTTON SPINNING MILLS

CHAPTER I

INTRODUCTORY

It is unnecessary at this period to draw attention to the importance of the subject of productive costs. The man who produces and sells any article of commerce without first assuring himself of its cost, is like the man who trusts himself on a stormy sea in a boat without first assuring himself that it is watertight. Both may sail along comfortably for a time; but, on the other hand, both may spring a leak without knowing it until it is too late.

A system of obtaining productive costs, if intelligently and efficiently carried out, shows up weak spots, and gives the manufacturer an opportunity of strengthening them. It also provides a basis upon which to calculate selling prices, thus preserving the manufacturer from that contemptible position of merely quoting his competitors' prices because he is unable to obtain his own. A system of costs, therefore, will have a twofold object. It will be: (1) Comparative, dealing with events that are past; with work that is accomplished; with facts—as where a trading account of a past year is analysed in

order to compare it with those of other years or those of other mills; (2) Estimating, as a basis for quotations for future business; for forecasting expenditure which will be required to produce some new article; dealing with estimates based on facts.

For the purpose of ascertaining comparative costs it is often possible and desirable to incorporate a system with the ordinary system of book-keeping, having in view the final statement of costs on the basis of each unit of production. For the purpose of estimating costs there will be employed individual calculations based on conclusions drawn from statistics, the collection of which is one function of a proper system of costing. Methods of ascertaining productive costs are as numerous as are the industries to which they relate, for it is easy to see that the method employed by a builder in ascertaining the cost of a cotton mill, or of an engineer in ascertaining the cost of its engine, will be very different from the method employed by a spinner in ascertaining the cost of a pound weight of yarn. Methods of ascertaining costs must vary with the requirements of each particular trade. It is therefore not accountancy alone which can deal with this question, but accountancy allied to a sound practical and commercial knowledge of the industry concerned. In calculating costs we have to remember that we are dealing with facts and with estimates, and it is well to keep before our minds the importance of ascertaining as many facts and as few estimates as possible; though of course some estimates will always be necessary.

An endeavour will be made in these pages to deal as fully as possible with the subject of cotton-mill costs, considering first in this chapter comparative costs—that is, costs on broad and general lines suitable for the comparison of the working of the same mill in different

years, or of different mills in the same year, and following with a detailed examination of the system of estimating costs for different counts and qualities of yarn.

Comparative Costs in Spinning Mills.—It is desirable that a spinning firm should analyse each year's or half-year's accounts, bringing them to some common basis of comparison. Since in most mills the counts and qualities of yarn spun are constantly changing, this basis of comparison will have to be a pound weight of yarn of average counts and quality, for it would be impossible to isolate the cost of each separate count of yarn and quality of yarn in the accountancy books of the mill. The cost of each separate count of yarn can only be ascertained by a process of estimating which will be dealt with later. The average counts will be ascertained by dividing the total hanks produced in the period under review by the total pounds weight produced, thus giving the average number of hanks in one pound, or the average count of yarn.

The trading account provides the only true basis of comparative costs, for there are included in it all charges down to the last postage stamp. Below is an imaginary condensed trading account:—

Trading Account for Six Months ending December 31, 1910

To Cotton used	£40,000	By Yarn produced	£55,000
„ Wages	8,000	„ Waste produced	2,000
„ Trade expenses (including interest and depreciation)	8,000		
„ Profit	1,000		
	£57,000		£57,000

It is desirable that the cotton, yarn, and waste ledger accounts from which these totals are drawn should all

be provided with columns for weights as well as for value; as, for example:—

1910 COTTON ACCOUNT

		Lb.	£			Lb.	£
July	To Cotton	140,354	8,321	Dec.	By		
Aug.	,,	159,321	9,356		Cotton		
Sept.	,,	83,120	5,216		used		
Oct.	,,	53,541	4,312		(to		
Nov.	,,	160,500	9,214		trading		
Dec.	,,	43,164	3,581		account)	640,000	40,000
		640,000	40,000			640,000	40,000

and similarly with yarn and waste accounts. From these figures we can calculate the amount of waste taken out of the cotton during its passage through the mill.

	Lb.		Lb.
Cotton used	640,000	...	—
Yarn produced	—	...	524,800
Waste produced	—	...	121,600
	640,000	...	646,400
Regain, *less* invisible loss ...	6,400	...	—
	646,400	...	646,400

The weight of yarn shown in the yarn ledger account is not the weight of yarn spun, but the yarn spun plus the regain. In the calculation given above it will be seen that the amount of regain has been just more than sufficient to cover the invisible loss due to the evaporation of moisture and the disappearance of fine dust during the working processes.

These results may now be set out in tabulated form, expressing the values in pence per pound of yarn produced, and the weights as a percentage of the weight of cotton used, adding the average counts for the purpose of comparison with previous years or with other mills.

——	£	Pence per Lb. of Yarn produced	Weight in Lb.	Percentage of Cotton used
Cotton used	40,000	18·293	640,000	100
Wages	8,000	3·659	—	—
Trade expenses ...	8,000	3·659	—	—
Profit	1,000	0·457	—	—
Regain, *less* invisible loss	—	—	6,400	1
	57,000	26·068	646,400	101
Yarn produced ...	55,000	25·153	524,800	82
Waste produced ...	2,000	0·915	121,600	19
Average counts, 82's	57,000	26·068	646,400	101

A comparison of results may now be made as follows:—

COST PER LB. OF YARN PRODUCED

——	June 1909	Dec. 1909	June 1910	Dec. 1910
Cotton used ...	16·314	17·321	19·103	18·293
Wages	3·741	3·735	3·581	3·659
Trade expenses ...	3·826	3·629	3·763	3·659
Profit	0·625	0·316	—	0·457
	24·506	25·001	26·447	26·068
Average counts ...	81's	79's	80's	82's
Yarn produced ...	23·571	24·125	25·101	25·153
Waste produced ...	0·935	0·876	1·025	0·915
Loss	—	—	0·321	—
	24·506	25·001	26·447	26·068

PERCENTAGE ON COTTON USED

——	June 1909	Dec. 1909	June 1910	Dec. 1910
Cotton used ...	100·00	100·00	100·00	100·00
Regain, *less* invisible loss	0·46	—	0·50	1·00
	100·46	100·00	100·50	101·00
Yarn produced ...	82·09	80·78	79·50	82·00
Waste produced ...	18·37	18·33	21·00	19·00
Invisible loss, *less* Regain	—	0·89	—	—
	100·46	100·00	100·50	101·00

These specimen tables have been condensed to economise space, but in actual working they are capable of much amplification. Trading expenses may be split up so as to show separately standing expenses and working expenses; or productive expenses, such as oil, leather, coal; distributive expenses, such as carriage and skips; financial expenses, such as interest, depreciation, and income tax. The waste produced may be divided into different classes, showing separately the percentage of card strippings, blowing-room droppings, and other wastes. We have then a collection of detailed information which by careful study and comparison will reveal the factors which have been responsible for the year's profit or its loss. Such information will show whether the year's loss is the result of an insufficient margin between the prices of cotton and yarn, or an increase in the working expenses, or the taking of an excessive amount of waste out of the cotton. It will also show

us if the invisible loss is too high, or if the regain is too low.

If the trading expenses are too large, our tables, when amplified, will show in what department of expenditure the increase has been incurred. If the amount of waste has been excessive, they will indicate the department in which the leakage has taken place. But there is a limit to the amount of information to be derived from this method of analysing a trading account, for the information is all concerned with yarn of the average counts and the average quality spun. Such a method will not show us which counts and qualities of yarn have been most profitable. It will not reveal the fact that though we have been making a profit on some qualities, we may have been giving a portion of it away with others. That information we can only obtain by an intelligent apportionment of the various items of cost over each separate count and quality made, for the higher counts will absorb more wages and general expenses than the lower counts, and the better qualities will cost more in cotton and waste than the poorer qualities.

Having no information on this point in the accountancy books of the mill or the trading account, we must resort to individual practical calculations of mill working—to estimating costs.

CHAPTER II

ESTIMATING COSTS—COTTON

We have seen that whilst the comparative analysis of the yearly or half-yearly trading account will reveal much valuable information, that information will be on broad and general lines only. For the purpose of quoting prices for different counts and qualities of yarn, its usefulness will be confined to the provision of a basis from which to work out separate calculations, varying with each different count and quality. Before entering into a detailed consideration of these calculations, let us briefly review the factors to be dealt with, and the ground to be covered.

Cotton having been bought at a price per pound, under "spot" or "c.i.f." terms, it is brought to the mill in bales. Bales of different grades and prices may be mixed together in a cotton stack, or in some later process, for the production of yarn of a required count and quality. The cotton then passes through eight or nine machines, some of which extract from it the sand, seeds, and heavier waste; others the short fibres, nepped cotton, leaf, and lighter waste. This waste is sold at varying prices, or portions of it may be used again for the making of yarn of a lower quality.

In addition to this visible waste, which may be weighed and sold, there is an invisible waste. Raw cotton under normal conditions as to the temperature and humidity of the atmosphere contains 7·8 per cent. of natural moisture. The temperature of a cotton mill being abnormally high, a portion of this moisture is evaporated

during the passage of the cotton through the mill. There is also a small amount of fine dust which rises into the air and is lost. But a portion of the lost moisture is recoverable. After the cotton has been spun into yarn its return to a normal atmosphere will cause it to regain some of this moisture, thus giving a greater selling weight of yarn than has been actually spun.

During all these processes wages are being expended which will be more per pound for fine counts than for coarse counts, since one takes longer to produce than the other. The cotton is also absorbing its share of general working expenses, of interest, and depreciation. When the yarn is marketed it is sold subject to a discount and credit varying with the different markets, home and foreign.

Our calculations then will be based on the factors—raw material (*i.e.*, cotton), wages and general expenses. They will allow for the waste taken out of the cotton during working, and for the amount received on the sale of the waste. They will take into consideration the amount of regain to which the cotton is subject after spinning, and will make allowance for the discount to be allowed on sale. Here is an outline:—

	d.	
Price of cotton	9·50	per lb.
Cost of cotton required to produce 1lb. of yarn (*i.e.*, with waste and regain allowed for)	11·40	per lb.
Received for sale of waste	0·54	
	10·86	per lb.
Wages	2·23	
General expenses	2·31	
	15·40	per lb.
Discount	0·39	
Cost to produce (without profit)	15·79	per lb.

Let us now consider these items separately and in detail.

Cotton.—We must first ascertain how much cotton is required to produce one pound weight of yarn of the particular count and quality we wish to investigate. This will depend on the amount of waste taken out of the cotton during working, and the amount of regain after spinning. In our comparative analysis we ascertained the percentage of waste taken out of the whole of the cotton during the period of six months. In a mill producing only carded yarns of similar quality this percentage is the most reliable figure to use for estimating costs, since it includes loss of every kind from the bale to the cop, and because the mass of material of which it is the average is such a large one.

But in a mill where cottons of widely different qualities are used, and where both carded and combed yarns are spun, the percentage obtained by an analysis of the trading account is not the waste of any particular quality, but only the *average* waste of all the qualities spun, and so can only form a basis of working. It is, however, desirable to use this basis where possible. In a mill spinning both carded and combed yarns the percentage of waste of the carded qualities will be less, and that of the combed qualities will be more, than the average ascertained by the half-yearly analysis. By deducting from the total weight of waste the amount of comber fly, we obtain the total weight of carded waste of all the yarn produced, and this will be a valuable figure, if in our calculations we first treat all yarns as carded only, and then in the case of combed yarns add on the extra combing percentage. For example:—

Cotton used	2,530,000lb. ...	100 per cent.
Yarn produced	1,973,400lb. ...	78 ,,
Visible and invisible waste loss	556,600lb. ..	22 per cent.
Comber waste produced ...	151,800lb. ...	—
Carded waste on total production	404,800lb. ...	16 per cent.

This gives an average carded waste of 16 per cent. which has been lost on every pound of yarn spun, whether carded or combed. The 151,800lb. of comber waste, which represents 6 per cent. on the total cotton used, will provide us with no useful information unless we can express it as a percentage on the combed production only, and this is not always possible, since a portion of it may have been mixed with other qualities.

But even in a mill producing only carded yarns, if widely different qualities of cotton are being used, it is possible they will yield different amounts of waste, and so even the average carded waste percentage must be adjusted to suit the different qualities. As it is not conveniently practicable to keep all the waste from different qualities separate, this adjustment may be based on the results of working test samples of say 100lb. of the different qualities, up to the end of the card. So we may find that in a sandy class of cotton the scutcher droppings will be 1 per cent. more than in a clean cotton, or that in a variable stapled cotton the card fly will be 2 per cent. more than in a regular stapled cotton, and so on. We may then utilize these results in forming an estimate of the waste of different qualities, adding to or deducting from the average percentage obtained from the half-yearly analysis.

There is then the regain to consider, in estimating the amount of cotton required to produce 1lb. of finished yarn. If 17 per cent. of waste is being incurred, then

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100lb. of raw cotton will produce at the mule spindle 83lb. of yarn. But if that yarn after leaving the spinning-room regains 5 per cent. in weight, this will mean that not 83lb., but 87·15lb., will be available for sale.

When we have once fixed the waste percentage and the amount of regain, we can ascertain the cotton constant number for the different qualities. The following examples will illustrate this matter:—

Quality No. 1 loses 17 per cent. waste, visible and invisible, and regains 5 per cent.

Raw cotton	100lb.
Waste	17lb.
Yarn spun	83lb.
5 per cent. regain	4·15lb.
Yarn produced	87·15lb.

Then if 87·15lb. yarn is produced from 100lb. cotton, there will be required to produce 100lb. of yarn—

$$\frac{100 \times 100}{87{\cdot}17} = 115\text{lb. cotton;}$$

or, to produce 1lb. of yarn, 1·15lb. of raw cotton.

If the price of cotton is $9\frac{1}{4}$d. per pound, then the cost in raw cotton per pound of finished yarn will be—

$$9{\cdot}25 \times 1{\cdot}15 = 10{\cdot}64\text{d.}$$

Quality No. 2 loses 18 per cent. of carded waste. It is then taken to the comber, and 20 per cent. of the cotton combed is removed as comber waste. The regain is 5 per cent. Now, not quite the whole of the 18 per cent. of carded waste is extracted before the combing process, but the difference is so small that we may assume it to be so for this purpose. Then—

Cotton	100lb.
18 per cent. carded waste	18lb.
	82lb.
20 per cent. comber waste	16·41lb.
Yarn spun	65·61lb.
5 per cent. regain	3·28lb.
Yarn produced	68·88lb.

If 68·88lb. of yarn is produced from 100lb. of cotton, then there will be required to produce 100lb. of yarn—

$$\frac{100 \times 100}{68{\cdot}88} = 145\text{lb. cotton};$$

or, to produce 1lb. of yarn, 1·45lb. of cotton. If the price of cotton is 12d. per pound, then the cost of raw cotton per pound of finished yarn will be $12 \times 1{\cdot}45 = 17{\cdot}4$d.

Or a yarn may be made from a mixture of two or more cottons which have been treated separately up to a certain point. If, for instance, quality No. 3 is made by putting together at the draw frame $\frac{2}{3}$ of quality No. 1, and $\frac{1}{3}$ of quality No. 2, then we get—

$$\begin{aligned} &(1.)\ 9{\cdot}25 \times 1{\cdot}15 = 10{\cdot}64. \\ &(2.)\ 12 \quad \times 1{\cdot}45 = 17{\cdot}4. \\ &\frac{(10{\cdot}64 \times 2) + (17{\cdot}4 \times 1)}{3} \end{aligned}$$

$= 12{\cdot}89$d., cost of raw cotton per pound of finished yarn.

It will be seen from these calculations that the cost to produce a pound weight of yarn varies with the varying price of cotton. If cotton rises in price the cost of production will rise also, because the amount lost in waste will have cost so much more than when cotton is lower in price. Of course there will be a tendency for the price of waste to rise also, but it will not be anything like sufficient to balance the increased cost in cotton.

This illustrates the fallacy of working from a fixed scale of costs to be used irrespective of the price of cotton; of saying, for example, that the cost of producing various counts is as follows:—

	40's.	50's	60's.	70's.	80's.
Cost to be added to price of raw cotton	3·4d.	4·1d.	4·9d.	6·3d.	8·1d.

These costs are no doubt quite correct at the time they are ascertained, but they may not be correct in a month hence, or even in a week hence, if the price of cotton fluctuates widely. They are only of use when applied to the particular price of cotton on which they have been based. To say that such and such a mill can produce 50's counts at 4d. per pound over the market price of cotton, is a meaningless statement, until we know the price of cotton to which it applies—until we know whether it has been based on the low cotton prices of, say, 1897, or the boom prices of, say, 1907.

Take, for instance, a yarn spun out of cotton at 6d. per pound, and some time later out of the same quality of cotton at 16d. per pound. That this variation of 10d. per pound is not a wide stretch of imagination can be verified from an examination of the quoted prices of cotton during the past fifteen years. Then—

	At 6d.	At 16d.
Price of cotton		
Constant for waste and regain	1·15	1·15
	6·9	18·4
Received for waste, say	0·3	0·48
	6·6	17·92
Less price of cotton	6·0	16·00
Cost in waste	0·6	1·92
		0·6
Increased cost to produce, due to rise in price of cotton	...	1·32d.

If the yarn is combed yarn, the difference is considerably greater. For example—

	At 6d.	At 16d.
Price of cotton		
Constant for waste and regain	1·45	1·45
	8·7	23·2
Received for waste, say	0·9	1·2
	7·8	22·0
Less price of cotton	6·0	16·0
	1·8	6·0
		1·8
Increased cost to produce, due to rise in price of cotton	...	4·2d.

CHAPTER III

COTTON (*continued*)

It is sometimes desired to compare the relative values of cottons of different quality and price in order to ascertain if there would be any economy in substituting one for another. Suppose, for instance, that a yarn is being made from a cotton at 12d. per pound, which during its passage through the mill is losing 15 per cent. in waste, visible and invisible. There is, however, a cotton $\frac{1}{4}$d. per pound cheaper, which is quite equal in staple, strength, and other features, and will make quite as satisfactory a yarn, but which contains a greater amount of dirt or of short fibres, and consequently makes a greater amount of waste—say 18 per cent. For this waste there is received an average price of 3d. per pound. Which cotton is cheaper, and by how much?

Obviously the common basis for comparison will be the cost in cotton per pound of yarn produced, less the amount received for waste.

Example:

"No. 1" Cotton at 12d. per Pound

If "No. 1" Cotton costs 12d. per pound and loses 15 per cent.—

Then 100lb. cotton will produce 85lb. yarn, and will cost	1200d.
There will be received for 12lb. waste (say 3 per cent. invisible) at 3d.	36d.
And the net cost in cotton will be	1164d.

Or per pound of yarn, $\frac{1164}{85} = 13{\cdot}7$d.

"No. 2" Cotton at 11¾d. per Pound

If "No. 2" Cotton costs 11¾d. per pound and loses 18 per cent.—

Then 100lb. cotton will produce 82lb. yarn, and will cost	1175d.
There will be received for 15lb. waste at 3d. ...	45d.
And the net cost in cotton will be	1130d.

Or per pound of yarn, $\frac{1130}{82} = 13{\cdot}8$d.

In this case the cotton at 11¾d. per pound is relatively dearer than the cotton at 12d. per pound, and therefore there would be no economy in substituting it for the other.

Or again, suppose a yarn is being made from a cotton "No. 3" at 15d. per pound, which loses 16 per cent., 13 per cent. of which is sold as waste at an average price of 3½d. per pound. A cotton "No. 4" at 13d. per pound, losing the same amount in carded waste, which sells at the same price, when combed with 15 per cent. loss at the comber is found to give an equally satisfactory yarn. The comber waste sells at 6d. per pound. What are the relative costs of these two cottons?

"No. 3" Cotton at 15d. per Pound

If "No. 3" Cotton costs 15d. per pound and loses 16 per cent.—

Then 100lb. cotton will produce 84lb. yarn, and will cost	1500·0d.
There will be received for 13lb. waste at 3½d. ...	55·5d.
And the net cost in cotton will be	1454·5d.

Or per pound of yarn, $\frac{1454{\cdot}5}{84} = 17{\cdot}3$d.

"No. 4" Cotton at 13d. per Pound

Cotton	100lb.
Carded waste	16lb.
	84lb.
15 per cent. comber waste	12·6lb.
Yarn	71·4lb.

If "No. 4" Cotton costs 13d. per pound and loses 16 and 15 per cent.—

Then 100lb. cotton will produce 71·4lb. yarn,		
and will cost		1300d.
There will be received for waste—		
13lb. at 3½d.	45·5d.	
12·6lb. at 6d.	75·6d.	
	———	121·1d.
And the net cost in cotton will be		1178·9d.

Or per pound of yarn, $\frac{1178 \cdot 9}{71 \cdot 4} = 16 \cdot 5$d.

"No. 4" cotton then would be relatively 0·8d., or 4·6 per cent. cheaper than "No. 3" cotton.

In these examples it will be noticed that the regain has not been taken into account. All that is required is some common basis of comparison, and to make allowance for regain would only complicate the calculation without serving any useful purpose. It is well to remember, however, that the values per pound of yarn spun are rather higher than the values per pound of yarn produced on this account, and so the difference between the two cottons, if regains were allowed for, would be a fraction less than that stated above, though the percentage of economy would be the same.

Now, where shall the spinner obtain the price of raw cotton on which to base the cost calculations? At first thought this may appear very simple. If he contemplates taking an order for yarn he may ask his cotton broker or merchant for the quotations of the particular class of cotton he will require.

But are these figures the correct ones on which to base a cost calculation? That will depend on whether the spinner is already in possession of cotton from which to make his contemplated order, or will have to buy some on the day, at the price ruling. This may mean a very material difference in the cost of the yarn, for if the spinner has cotton in his possession which is not allo-

cated to yarn orders, that cotton may stand in his books at a very different price from that which he would have to pay if he bought cotton on the day. It must then first be ascertained whether the yarn orders on the books are covered in cotton, or whether there is some cotton against which no yarn has yet been sold.

On the result of this investigation will depend the price on which to base the cost. If there is any unappropriated cotton, then the price will be the price at which it stands in the books; if there is no such cotton, and the yarn orders are only just covered, the price will be the price ruling on the day.

This information will be of use not only for the purpose of costing, but also as a safeguard against unconscious speculation, for unless the spinner knows whether his yarn orders are covered in cotton or not, he runs a great risk from fluctuations in the market price of raw cotton.

There must be some rapid method of ascertaining the yarn on order, and of setting off against it the yarn in stock and the cotton purchased which is yet unused, bearing in mind the fact that more than one pound of raw cotton will be required to produce one pound of yarn, and allowing for this on the lines already indicated. This may be done by a continuous calculation beginning with the new year or half-year, when stocks are verified, and terminating with the next stocktaking, when a new calculation may be begun.

Opinions will perhaps differ as to whether the cotton in process of manufacture should be taken into consideration in such a calculation, it being argued on the one hand that this is a fixed quantity, which will never be sold so long as the mill is a going concern, and that therefore it should not be taken into consideration; and on the other hand, that as its value rises and falls with the varying

price of the market, just as much as if it were in bales or in cops, it must be taken into account.

Perhaps the simplest method of obtaining the required information is to treat the figures as debits and credits in a ledger account, commencing the calculation by placing on one side the weight of yarn on order, less the weight of yarn in stock, and adding at daily, weekly or monthly intervals the weight of yarn sold; and on the other side commencing with the cotton held (including that in process of manufacture or not, according to opinion), and adding the weight of cotton as purchased. Then by multiplying the yarn weight by the cotton and waste constant previously described, it may be seen at a glance whether the yarn orders are covered or not.

Example :

Jan. 1/11:		Jan. 1/11:	
Yarn on order ...	100,000lb.	Cotton held ...	110,000lb.
Less yarn in stock	22,000lb.	Purchased to date ...	50,000lb.
	78,000lb.		
Sold to date	52,000lb.		
	130,000lb.		160,000lb.

Then, if the cotton constant is 1·2—

$160{,}000 - (130{,}000 \times 1{\cdot}2) = 40001\text{b.}$ over-covered in cotton.

A variation of this method is to reduce the weight of cotton as purchased to yarn, thus dispensing with the use of the cotton constant, and showing the position at a glance without any further calculation.

Example :

Jan. 1/11 :		Jan. 1/11 :	
Yarn on order ...	100,000lb.	Cotton held, *less* waste	91,667lb.
Less yarn in stock	22,000lb.	Purchased to date, *less* waste	41,666lb.
	78,000lb.		
Yarn sold to date ...	52,000lb.		
	130,000lb.		133,333lb.

Then $133{,}333 - 130{,}000 = 3333\text{lb.}$ yarn undersold.

It must, however, be remembered, if this method is employed, that the amount over or under covered is expressed as yarn, and not as cotton as in the first example. The 3333lb. yarn in the second example equals the 4000lb. cotton in the first example, as will be seen by multiplying 3333 by 1·2, the cotton constant—

$$3333 \times 1{\cdot}2 = 4000\text{lb. cotton.}$$

If more qualities than one are being spun, then the calculation may be amplified so as to show the position of each separate quality.

Sale of Waste.—In ascertaining the cost of raw cotton per pound of yarn, there must be deducted from the gross cost the amount received from the sale of waste per pound of yarn produced. This will be governed by the average price of waste, which must first be obtained. If the waste is being sold at the same price as in the previous year or half-year, this may easily be obtained from the analysis of the trading account; but if higher or lower prices are now being obtained, the new figure must be ascertained by raising or lowering the analysis figure in proportion to the rise or fall in price.

But in many cases it may not be possible to use the analysis figure at all, for where different qualities are being made with different classes of waste, the analysis figure will represent only the average price of all the qualities, and so it will be necessary to ascertain a waste value for each separate quality.

The trading account analysis will have shown the percentage of the various classes of waste, and from this and the prices of the new waste contract the average prices of carded and combed wastes, or of the different wastes made by different qualities of cotton, can be obtained.

Example :

		Price.	
Droppings	2 per cent.	0·2d.	0·4d.
Fly	2 ,,	2d.	4d.
Strippings	5 ,,	6d.	30d.
Sundry wastes	3 ,,	4d.	12d.
Waste sold	12 ,,		12) 46·4d.
Invisible	3 ,,		3·87d.
Total loss	15 ,,		

=3·87 average price of carded waste.

This may now be applied to the calculation for cost—

QUALITY "No. 1."

Cotton	100lb.
Sold waste	12lb. at 3·87d. per lb.
	88lb.
Invisible	3lb.
Yarn	85lb.
5 per cent. regain	4·25lb.
Yarn produced	89·25lb.

Then the value of waste per pound of yarn produced is—

$$\frac{12 \times 3{\cdot}87\text{d.}}{89{\cdot}25} = 0{\cdot}52\text{d.}$$

QUALITY "No. 2."

Cotton	100lb.
Carded waste sold	12lb. at 3·87d. per lb.
	88lb.
Invisible	3lb.
	85lb.
20 per cent. comber waste ...	17lb. at 6d. per lb.
Yarn	68lb.
5 per cent. regain	3·4lb.
Yarn produced	71·4lb.

Then the value of waste per pound of yarn produced is—

$$\frac{(12 \times 3{\cdot}87) + (17 \times 6)}{71{\cdot}4} = 2{\cdot}08\text{d.}$$

Quality "No. 3"

(composed of $\frac{2}{3}$ of "No. 1" and $\frac{1}{3}$ of "No. 2"):

$$\frac{2\,(12 \times 3{\cdot}87) + (12 \times 3{\cdot}87) + (17 \times 6)}{2\,(89{\cdot}25) + 71{\cdot}4}$$

$= 0{\cdot}97$d. received for waste per pound of yarn produced.

CHAPTER IV

PRODUCTION

In any efficient system of costing a carefully ascertained table of productions is absolutely necessary. Each of the two items of cost, wages and expenses, varies according to production. The yarn which takes a long time to produce will absorb more wages and more expenses than the yarn which takes only a short time to produce; and it is of the utmost importance that the amounts of yarn of different counts produced in a given time should be carefully ascertained and correctly recorded. In the apportionment of wages and expenses on the basis of production, any under-estimate or over-estimate of the weights produced will have a material effect on the cost of the yarn.

The cotton-spinning industry lends itself easily to the correct tabulation of productions. All its producing units are the same—viz., the spindle; there are often thousands of them producing the same article, identical in every respect; and often they are producing it for weeks or months at a stretch. There is then, in the mill, a mass of data of what has been already accomplished, which, when tabulated, will be a valuable guide to productions for costing purposes.

In a mule-spinning mill the productions of yarn will be ascertained weekly for the payment of minders' wages. These productions, however, may not always be in pounds weight; they may be in hanks per spindle, or in draws. It is desirable, even at the expense of some little inconvenience, that the yarn produced should be weighed

weekly, though the weight may not be required for the purpose of calculating the minders' wages; because any method of calculating the weight from hanks or draws is liable to a certain amount of error. If, however, from any reason it is inconvenient to weigh the yarn, then the productions, if stated in hanks or draws, will have to be transformed into pounds weight by calculation. Suppose the productions are stated in hundreds of draws (a common method of payment), then—

$$\frac{\text{The total length in inches put up each draw} \times \text{the number of spindles per mule} \times 100 \text{ draws} \times 96}{36\text{in. per yard} \times 840\text{yds. per hank} \times 100}$$

= the number of hanks produced per hundred draws per mule.

In this calculation 4 per cent. has been deducted from the theoretical production for loss through breakage of ends. This percentage of breakages will vary with different qualities of yarn, and can only be ascertained by experiment. If for a number of weeks the yarn is weighed, and then compared with the theoretical production, the percentage of breakages may be ascertained by a simple calculation.

If, then, mules of 1000 spindles each are putting up 65in. of yarn each draw, and losing 4 per cent. of production by breakages, the production will be—

$$\frac{65 \times 1000 \times 100 \times 96}{36 \times 840 \times 100}$$

= 206 hanks per mule per one hundred draws.

This figure may now be used as a constant number for converting draws to pounds. For example:—

$$\frac{\text{Constant number} \times \text{hundreds of draws}}{\text{Counts}}$$

= pounds produced per week per mule.

If the productions in hundreds of draws per pair of mules per week are—

Counts . . .	50's	60's	and	70's
Hundreds of draws .	209,	210,		204,

then the productions in pounds will be—

$$\frac{206 \times 209}{50} = 861$$

$$\frac{206 \times 210}{60} = 721$$

$$\frac{206 \times 204}{70} = 600$$

If the productions for the payment of wages are expressed, not in draws, but in hanks per spindle, then—

$$\frac{\text{Hanks per spindle} \times \text{number of spindles} \times 96}{\text{Counts} \times 100}$$

= pounds produced per mule per week.
Or, to use a constant number—

$$\frac{\text{Number of spindles} \times 96}{100} = \text{constant number,}$$

as,

$$\frac{1000 \times 96}{100} = 960, \text{ constant number,}$$

and,

$$\frac{\text{Constant number} \times \text{hanks per spindle}}{\text{Counts}}$$

= pounds produced per mule per week.

If the productions in hanks per pair of mules are—

Counts . . .	50's	60's	and	70's
Hanks . . .	46,	44,		42

(*i.e.*, 23, 22 and 21 hanks per spindle, per mule respectively), then the productions in pounds will be—

$$\frac{960 \times 46}{50} = 883$$

$$\frac{960 \times 44}{60} = 704$$

$$\frac{960 \times 42}{70} = 576$$

per pair of mules per week.

Productions obtained in this way, however, are liable to a certain amount of error because of the variation in the amount of broken ends from that allowed, and also of the variation in the counts from those calculated upon. Therefore, where possible, it is desirable that the weight should be ascertained by actual weighing.

The weekly production of the various counts having been ascertained, it is necessary to extract from them the average productions for the purpose of costing. As the amounts produced will vary at different times of the year, and with different minders and mules, it is desirable that the figures from which the averages are drawn should cover as much space and time as possible, other conditions being equal. The productions of a selected minder or a selected period should not be used alone, but should take their proper place in relation to the productions of other minders and other periods, so as to give a fair average of all minders and all periods; for if the productions arrived at are too high, the costs of the yarn will be too low; and if the productions are too low, the costs of the yarn will be too high.

The average productions of the various counts having been ascertained, they may be stated in pounds weight per 1000 spindles, so as to give a convenient basis for costing. These productions will be the weights turned

off per 1000 spindles in one full week's working if there are no breakdowns in the machinery. But if a breakdown occurs the weekly production will fall below the average, and therefore in any table for costing purposes allowance must be made for these occasional breakdowns, and consequent losses of production.

The frequency of these temporary stoppages will vary in different mills according to the age of the machinery, the speed worked and other factors. The amount of allowance will therefore be fixed by practical experience of the particular mill concerned, and an examination of the records of its past working.

Suppose it is estimated that 1 per cent. of the total production is lost through this cause, then the productions already ascertained will require to be reduced accordingly for costing purposes. The figures obtained will be the productions at the spindle point; but after leaving the spindle the weight of yarn will increase owing to regain, and therefore the final productions for costing will be more than those of the spindles by the amount of regain.

Assuming the regain to be 5 per cent., the spindle figures must be increased by that amount. The resultant productions will be permanent for costing so long as the same conditions hold, and may be stated in tabulated form.

TABLE OF PRODUCTIONS

Counts	Lb. per 1000 Spindles per week	Less 1 per cent. Breakdowns	With 5 per cent. Regain
30's	620	614	645
40's	550	544	571
50's	431	427	448
60's	362	358	376
70's	306	303	318
80's	247	245	257
90's	202	200	210
100's	157	155	163

These tables are to be used for all estimating costs, until the conditions change, or until a new table is constructed from the workings of a new period. The use for costing purposes of an isolated instance of production is to be condemned for the reasons already explained. If the production of an intermediate count is required, it may be ascertained fairly accurately from a study of the table.

If the curve A B in Fig. 1 represents the productions of 30's to 100's counts, then the production of 46's will be 500lb., and the production of 74's will be 295lb.

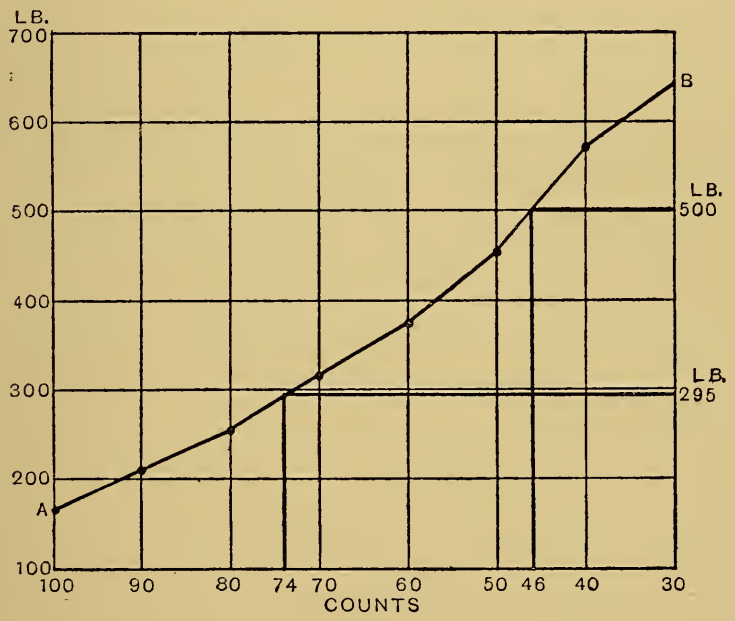


FIG. 1.
Yarn Productions per 1000 Spindles per week.

Such a table of productions will also be of service in ascertaining the relative profits or losses on different counts of yarn. Suppose a spinner calculates the costs of two different counts of yarn as follows:—

Counts	50's	100's
Cotton and waste	13·16	20·80
Received for waste	0·48	1·32
Net cost in cotton	12·68	19·48
Wages	1·65	4·85
Expenses	1·48	4·40
	15·81	28·73
Discount	0·40	0·74
Cost	16·21	29·47
Selling price	17·00	31·20
Profit per pound	0·79	1·73

On the 50's there is a profit of 0·79d. per pound, and on the 100's a profit of 1·73d. per pound. But it is impossible to say from these figures alone which of the two yarns is the more profitable to the spinner. The 100's counts being a finer yarn than the 50's requires a greater margin per pound to give the same profit, and it is only by qualifying these figures by the productions of the yarn that it is possible to obtain their relative profits.

If the production of 50's is 500lb. per 1000 spindles per week, and that of 100's is 170lb. per 1000 spindles per week, then the profit on 50's per 1000 spindles is $0{\cdot}79 \times 500 = 395$d.; and the profit on 100's per 1000 spindles is $1{\cdot}73 \times 170 = 294$d., showing that in this particular case the 50's is the more profitable yarn to produce at the moment.

It is well from time to time to ascertain the relative profits of the whole of the counts being spun. These, when tabulated in suitable form, will show at a glance which are the more profitable yarns, as in the following example:—

Counts	30's	40's	50's	60's
Cotton and waste	12·00	13·16	13·16	13·16
Received for waste	0·48	0·48	0·48	0·48
	11·52	12·68	12·68	12·68
Wages	1·22	1·61	1·65	2·00
Expenses	1·10	1·41	1·71	2·01
	13·84	15·70	16·04	16·69
Discount	0·35	0·40	0·41	0·43
Cost	14·19	16·10	16·45	17·12
Selling price	15·00	16·00	16·50	17·00
Profit	0·81	—	0·05	—
Loss	—	0·10	—	0·12
Production per 1000 spindles, lb. ...	645	571	448	376
Profit per 1000 spindles, pence ...	**582**	—	**22**	—
Loss per 1000 spindles, pence ...	—	**57**	—	**45**

CHAPTER V

WAGES

HAVING ascertained a complete table of productions, we may proceed to apply them to the division of wages per pound of yarn produced.

In the trading account analysis we have the total amount paid in wages during the past year or half-year. If the figures are for a year, and assuming that the time of working is 50 weeks (*i.e.*, 52 weeks, less two weeks for holidays), then the amount of wages divided by 50 will give the average weekly wage. In using the figures of a past period, however, care must be taken to see that the same conditions existed then as now. It may be that an advance or a reduction of wages has taken place, or that they were the wages for a period when short time was being worked. Any changes of this description would, of course, render the figures of a past period useless. But where the conditions are identical it is desirable, for many reasons, that the figures of a past year or half-year should be used. The average wage thus obtained compares with the average productions which are contained in the production tables; if the wages of one particular week are taken they will probably be too low, for there are a number of wages—those of officials, clerks, and skilled hands—which are paid during holiday times, and which would not be included in the cost; there are sometimes abnormal weeks, when engineers, mechanics, and others have been working overtime at breakdowns and repairs; and there are perhaps times when the cardroom production has over-run the spinning-room requirements, and machinery

has been temporarily stopped. All these facts should be taken into account where possible, and so it is desirable to use the average weekly wage figure obtained from the trading account rather than that of any particular week.

Having obtained the average weekly wages for the whole mill, they may be reduced to wages per 1000 spindles, so as to be on the same basis as the productions to which they are to be applied.

Suppose a mill contains 80,000 spindles, and its annual wages bill amounts to £14,000, then the weekly wages are $\frac{£14{,}000}{50}$ = £280, and the weekly wages per 1000 mule spindles are $\frac{£280}{80}$ = £3, 10s. or 840d. This amount includes the wages for spinning, for card-room preparation, for general hands, and for warehousing. It also includes the wages paid to skilled hands at holiday times and its proper proportion of the wages of abnormal weeks. Applying these figures to the previously ascertained table of productions we obtain the cost of wages per pound of yarn produced, as in Table I.

TABLE I.—Cost of Wages per Pound of Yarn

Counts	Weekly Production per 1000 Spindles, In Lb.	Weekly Wages per 1000 Spindles	Wages per Lb. on Yarn
		d.	d.
30's	645	840	1·316
40's	571	840	1·471
50's	448	840	1·875
60's	376	840	2·234
70's	318	840	2·641
80's	257	840	3·268
90's	210	840	4·000
100's	163	840	5·153

This method of apportioning wages on the basis of mule productions is simple to understand, quickly applied, and is without complications of working. But it is open to this criticism: that in many cases it is not a correct division of cardroom wages. Suppose a mill is spinning 30's and 100's, with weekly productions of 640 and 160lb. per 1000 spindles respectively. The production of 30's being four times that of 100's, the wages for 30's would be a quarter of those for 100's. So far as the spinning-room is concerned this will be fairly correct; but as regards cardroom wages it will not represent the facts. Up to a certain point, perhaps the slubbing frame, these two yarns will have run side by side, being the same weights with the same productions and incurring exactly the same wages per pound; and even when the roving for 100's is separated from the roving for 30's by reason of its greater fineness, it will not, in all probability, cost in wages four times that of the roving for 30's. If 70's and 100's are considered, the 70's having twice the production of the 100's, it is possible that up to the mule itself these two yarns would run side by side, being made from the same hank roving and incurring exactly the same amount in wages up to that point. But dividing wages on the basis of production per 1000 mule spindles we should get twice the amount for 100's as for 70's, not only at the mule but all through the cardroom.

This inaccuracy may be illustrated by the simple diagram shown in Fig. 2. In this diagram A and B are two yarns, B having double the production of A per 1000 mule spindles. In apportioning wages on the basis of production per 1000 mule spindles, the cost of A will be twice that of B, say 4d. and 2d. per pound respectively. These costs are represented by the lines A^1, B^1, showing that at any point in the process of manu-

facture between raw cotton and yarn the wages for A are twice those for B. But up to the mule these two yarns have perhaps run side by side, being made from the same hank roving, and therefore the yarn A up to that point has only cost in wages the same amount as B. Yarn A is therefore overcosted, whilst B is undercosted, as shown by the lines A^2, B^2, which represent the actual cost.

Let us consider this in greater detail. Suppose a mill of 80,000 spindles to be spinning 40's and 60's, with

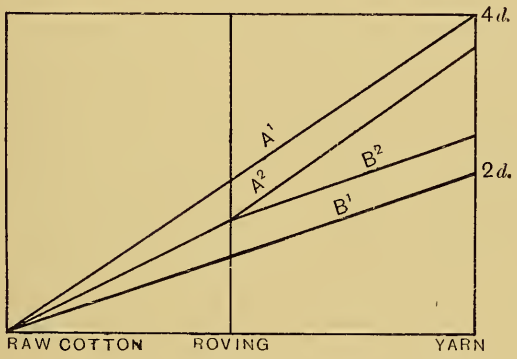


FIG. 2

productions of 570 and 370lb. per 1000 mule spindles per week respectively; 40,000 spindles are making 40's and 40,000 spindles are making 60's. This gives a weekly production of 22,800lb. of 40's and 14,800lb. of 60's—a total of 37,600lb. The two yarns are being made from the same hank roving, thus incurring the same wages per pound of yarn up to the mule creel. The wages are £237 per week, £65 being for cardroom wages, and £172 being for spinning-room and general wages. Then under the method of apportioning wages on the basis of mule productions only, the costs in wages would be as in Table II.

TABLE II.

Counts	Production	Wages	Cost per Lb. of Yarn
	Lbs.	d.	d.
40's	570	711	1·25
60's	370	711	1·92

If we were to show cardroom and spinning-room wages separately, the costs would be as in Table III.

TABLE III.

Counts	Production	Cardroom		Spinning-room		Total
		Wages	Per Lb.	Wages	Per Lb.	
	Lbs.	d.	d.	d.	d.	d.
40's	570	195	0·34	516	0·91	1·25
60's	370	195	0·53	516	1·39	1·92

But up to the mule equal wages have been incurred by these two yarns, viz., $\frac{£65}{37,600} = 0{\cdot}42$d. per pound, and only at the mule does the variation in cost of wages occur. The correct apportionment of wages, therefore, is as in Table IV.

TABLE IV.

Counts	Production	Spinning-room		Cardroom per Lb.	Total
		Wages	Per Lb.		
	Lbs.	d.	d.	d.	d.
40's	570	516	0·91	0·42	1·33
60's	370	516	1·39	0·42	1·81

A comparison of the two methods, and the amount of error of the first one, may be seen at a glance from the diagram given in Fig. 3.

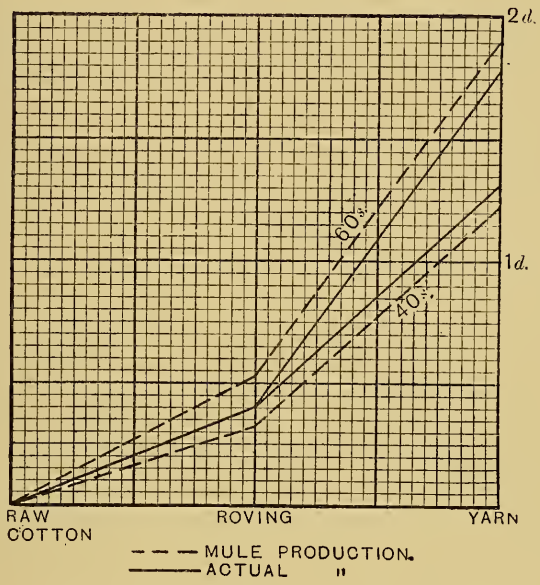


FIG. 3

In the first and simpler method of apportioning wages the 40's has been undercosted to the extent of 0·08d. per pound, whilst the 60's has been overcosted to the extent of 0·11d. per pound. If we consider the cost of 50's, with a production of 450lb. per 1000 spindles, we shall find that there is practically no difference in the cost whichever method is employed; for 50's, with wages apportioned on the basis of mule productions only, would cost in wages 1·58d., whilst if cardroom and spinning-room wages are separated according to their own productions the cost would be 1·57d. (0·42d. + 1·15d.).

We may lay it down, therefore, that where the method of apportioning wages on the basis of mule productions only is employed, and where there is a range of counts being spun, the higher counts will probably be overcosted and the lower counts will be undercosted, whilst the average counts will probably vary very little from the actual cost as ascertained by a more detailed analysis of wages.

As to whether it is desirable to further analyse wages on the basis of the different processes for costing purposes, it is a matter for each spinner to decide, being guided by the particular conditions in vogue in his own mill. The method of allocating wages per production per 1000 mule spindles divides all wages in the ratio of spinning-room productions, and so where wide ranges of counts are being spun results in some inaccuracies. On the other hand, spinning-room wages constitute by far the greatest bulk of the wages paid, being perhaps three times as much as all other wages put together, and so the inaccuracies are not in the most important but only in the least important section of wages. It may also be argued that so long as we only deal with spinning-room productions and divide wages accordingly, we are on sure ground as to the basis upon which we commence; whilst if we endeavour to assess the separate wages for blowing, carding, drawing, slubbing, roving, and also for general hands, according to their own particular productions, we are not so sure as to our ground in the matter of productions.

In this matter the case of each particular mill must be settled on its own merits, taking into consideration the various counts of the cardroom preparations, and the width of the range of the counts of yarn spun from each preparation. In some cases it may be that the further division of wages would be only the imposition

of a great amount of labour for a result which would be a mere splitting of hairs; whilst in others it may be a material consideration, resulting in a difference of costs of anything up to ½d. or even more per pound of production.

In mills where the preparations spin only narrow ranges of counts, the inaccuracy will be only slight;

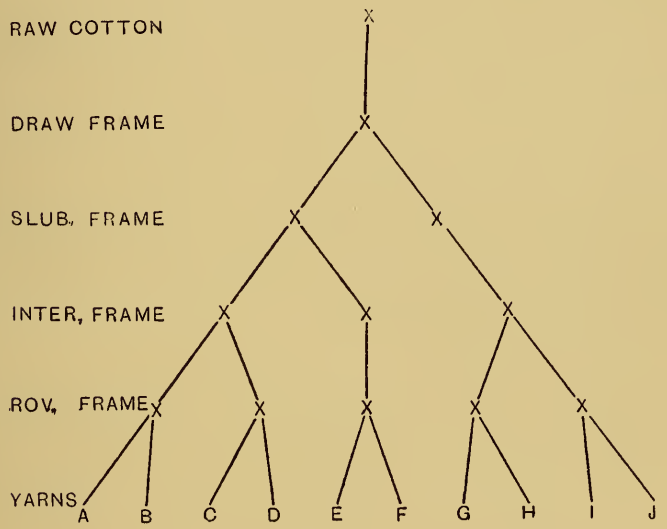


FIG. 4

Specimen Mill Working.

but where wide ranges of counts are spun from the same preparation the inaccuracy will be greater. This fact will be better understood by reference to Fig. 4, illustrating a specimen mill working.

Up to the draw frame all the cotton is treated alike, and so up to that point all the yarns A to J incur the expenditure of the same amount in wages. Then the production is divided, and at the slubbing frame two different counts are being produced, one sliver making

yarns A to F, and the other finer yarns G to J. At the intermediate frame a further division of the production takes place, A to D still running together and incurring still the same wages, E to F and G to J being produced from different and finer hanks, and so incurring higher wages. At the roving frame there are five different hanks, and at the mule each of these five different hanks produces two different counts of yarn. The actual cost in wages of these various yarns therefore would not vary in exact ratio to the mule productions, because yarns with different mule productions would run together up to some point in the preparation, and up to that point would incur the same wages.

The two methods of costing for wages in such a mill, and the inaccuracy resulting from the apportionment on the basis of production per 1000 mule spindles, may be seen by a study of Table V.

TABLE V.

Yarns	A	B	C	D	E
Weekly productions in lb. per 1000 mule spindles	720	610	550	464	390
Wages to drawing frame ...	0·164	0·164	0·164	0·164	0·164
Wages of slubbing	0·028	0·028	0·028	0·028	0·028
,, intermediate	0·053	0·053	0·053	0·053	0·063
,, roving	0·142	0·142	0·183	0·183	0·211
,, spinning and general hands...	0·717	0·846	0·937	1·112	1·325
Total wages per pound	1·104	1·233	1·365	1·540	1·791
Cost on basis of production per 1000 mule spindles	0·988	1·166	1·293	1·532	1·823
Overcosted	—	—	—	—	**0·032**
Undercosted	**0·116**	**0·067**	**0·072**	**0·008**	—

TABLE V. (*continued*).

Yarns	F	G	H	I	J
Weekly productions in lb. per 1000 mule spindles	340	255	196	171	139
Wages to drawing frame ...	0·164	0·164	0·164	0·164	0·164
Wages of slubbing	0·028	0·050	0·050	0·050	0·050
,, intermediate	0·063	0·124	0·124	0·124	0·124
,, roving	0·211	0·275	0·275	0·370	0·370
,, spinning and general hands...	1·521	2·025	2·637	3·012	3·723
Total wages per pound	1·987	2·638	3·250	3·720	4·431
Cost on basis of production per 1000 mule spindles	2·091	2·788	3·628	4·158	5·116
Overcosted	**0·104**	**0·150**	**0·378**	**0·438**	**0·685**
Undercosted	—	—	—	—	—

CHAPTER VI

WAGES (*continued*)

SUPPOSE the spinner decides that in his particular case it is desirable that wages should be apportioned on a more detailed basis than that afforded by the productions per 1000 mule spindles. How shall this be done?

In a mill where all the counts of yarn are spun from the same hank roving, each pound of yarn of whatever count will bear the same amount of cardroom wages, and so in such a case the correct amount of cardroom wages for any count is obtained by dividing the whole of the cardroom wages equally over the total weight of yarn produced. But where more hank rovings than one are produced from the same intermediate bobbin, the point of division will be further back—*i.e.*, all cardroom wages up to the roving frame, divided equally over all the yarn produced, irrespective of the counts, will give the correct amount of wages incurred up to that point. If more intermediate hanks than one are being produced from the same slubber bobbin, we must go back one step further, dividing only those wages which are incurred up to the intermediate frame, equally over the total yarn produced, irrespective of counts. In a mill with a complicated production it is a good plan to illustrate the history of each count of yarn by means of some simple diagram (such as that shown in Fig. 4, p. 39).

The first step, then, is to discover the point at which the division of wages must commence—*i.e.*, the point up

to which the whole of the cotton used is treated alike, in the matters of wages and productions. Up to that point the whole of the counts spun will bear an equal amount of wages, and from that point each count will follow its own course, bearing more or less wages than other counts, according as it is finer or coarser.

What is required is the statement of wages of the separate cardroom processes (treating all processes up to the point of division as one process only) per pound of yarn produced. This will involve: (1) The division of the total wages paid into the total wages for each separate process; (2) the ascertaining of the productions of each separate process, expressing them as weights of yarn which they will ultimately produce; (3) the application of the productions to the wages so as to ascertain the cost in wages per pound of yarn produced, at that particular process.

The wages for each process are obtainable from the wage books of the mill. In many cases the productions also are obtainable from the same source. Wages and productions must be reduced to some common basis so that the one may be applied to the other; it may be per frame, or per 100 spindles, or per draw frame delivery, as is thought to be most convenient. As regards productions, it is not needful to repeat here what has been already said on this matter, when dealing with mule productions, as to the care necessary in ascertaining them. It is sufficient to say that they must be representative productions expressing the average amounts produced by all machines and under all circumstances.

Probably the simplest method of illustrating this subject of the division of wages will be to give an example. We will assume a mill is making yarns varying from 30's to 100's in counts, and the counts of the various cardroom preparations are as in Table VI.

TABLE VI.—Counts of Cardroom Preparations

Counts of Yarn	30's	60's	80's	90's	100's
Finishing drawing ..	0·25	0·25	0·25	0·25	0·25
Slubbing frame	0·75	1	1	1	1·25
Intermediate frame	2	3·5	3·5	4	4·5
Roving frame	6	10	12	14	16

The average weekly productions of the various counts and processes are as in Table VII.

TABLE VII —Productions

Drawing: In Lb. per Finishing Delivery		Slubbing: In Hanks per Spindle		Intermediate: In Hanks per Spindle		Roving: In Hanks per Spindle		Mule: In Lb. per 1000 Spindles, including Regain	
Counts	Production	Counts	Production	Counts	Production	Counts	Production	Counts	Production
	lb.		hanks		hanks		hanks		lb.
0·25	650	0·75	52	2	40	6	35	30	645
—	—	1	50	3·5	37	10	33	60	376
—	—	1·25	48	4	36	12	31	80	257
—	—	—	—	4·5	35	14	28	90	210
—	—	—	—	—	—	16	26	100	163

Table VIII. shows the quantity of machinery at work in the different processes.

TABLE VIII.—Machinery

Mule spindles	80,000
Roving spindles	8,880
Intermediate spindles	2,000
Slubbing spindles	580
Finishing deliveries of draw frames	48

The average weekly wage bill is as in Table IX.

TABLE IX.—Weekly Wages

Op to finishing drawing	£22, 0s.
Slubbing frames	3, 10s.
Intermediate frames	9, 10s.
Roving frames	30, 0s.
Spinning-room	150, 0s.
General wages	22, 0s.
Total ...	£237, 0s.

Up to the finishing head of drawing all the cotton is treated alike, having one weight, one production, and consequently one value per pound in wages. It is not necessary, therefore, to divide the wages before this point in the process of manufacture. The wages up to the finishing head of drawing will consist of the wages of cotton mixers, blowing-room hands, card tenters, strippers and grinders, draw-frame tenters, and also the proper proportion of the wages of supervision—*i.e.*, of carders, under-carders, etc. The slubbing, intermediate, and roving wages will consist of the tenters' and back tenters' wages, and also their proper proportion of the wages of supervision. The spinning wages will include the wages of minders, piecers, overlookers, labourers, etc. The general wages will consist of the wages of clerks, engineers, mechanics, warehousemen, etc. It is now necessary to reduce these wages to some basis which is suitable for their application to the different productions. The basis in Table X. is suggested as a convenient one.

TABLE X.—Division of Wages over Processes

Process	Machinery	Weekly Wage	Basis
Up to drawing	48 deliveries	£22, 0s.	110d. per delivery.
Slubbing ...	580 spindles	3, 10s.	145d. per 100 spindles.
Intermediate	2,000 ,,	9, 10s.	114d. ,, 100 ,,
Roving ...	8,800 ,,	30, 0s.	82d. ,, 100 ,,
Spinning ...	80,000 ,,	150, 0s.	516d. ,, 1000 ,,
General ...	80,000 ,,	22, 0s.	
		£237, 0s.	

(Taking all the machinery together on the basis of the division of wages per production per 1000 mule spindles, we should get $\frac{£237}{80} = 711$d. per 1000 mule spindles per week.)

We require next the productions of the different processes and counts expressed on the same basis as the wages. The costs to be ultimately obtained are the costs *per pound of yarn produced.* The productions in Table VII. are the productions of the different machines at their own spindles. These will therefore have to be somewhat modified in order to bring them to the basis of pounds weight of yarn produced, for the weight of cotton at the different cardroom processes will not be the weight produced at the mule spindle, nor will it include the regain after spinning. There will be some loss in waste between the cardroom processes and the finished yarn, and this waste loss may be taken into account in calculating the productions by a simple calculation. Suppose it is ascertained from actual tests, and from the half-yearly analysis of wastes, that the waste of the later cardroom processes and of spinning is 2 per cent., and that the amount of regain is 5 per cent.: then a draw-frame production of 100lb. must be increased to 103lb. in order to equal the amount of yarn which will ultimately be produced from it. Making this allowance for waste and regain, the productions in Table VII. expressed as pounds weight of yarn, and on the same basis as wages, will be as follows:—

Draw Frames:

$$\frac{650 \times 103}{100} = 669\text{lb. per delivery per week.}$$

Slubbing Frames:

$$\frac{52 \text{ hanks per spindle} \times 100 \text{ spindles} \times 103}{0{\cdot}75 \text{ hank per pound} \times 100}$$

0·75 hank	...	...	7141lb. per 100 spindles per week.
1	,, ...	...	5150 ,, ,,
1¼	,, ...	...	3955 ,, ,,

Intermediate Frames :

2	hank	...	...	2060lb. per 100 spindles	per week.
$3\frac{1}{2}$	,,	...	...	1089 ,,	,,
4	,,	...	...	927 ,,	,,
$4\frac{1}{2}$	,,	...	...	801 ,,	,,

Roving Frames :

6	hank	...	...	601 ,,	,,
10	,,	...	...	340 ,,	,,
12	,,	...	..	266 ..	,,
14	,,	...	...	206 ,,	,,
16	,,	...	...	168 ,,	,,

These productions may now be applied to the wages given in Table X., in order to ascertain the cost per pound of the different counts, as in Table XI.

TABLE XI.—Application of Wages to Productions

Yarn Counts :	30's				60's				80's			
Process	Counts	Production	Wages	Per Lb.	Counts	Production	Wages	Per Lb.	Counts	Production	Wages	Per Lb.
		Lb.	d.	d.		Lb.	d.	d.		Lb.	d.	d.
Up to drawing	0·25	669	110	0·164	0·25	669	110	0·164	0·25	669	110	0·164
Slubbing	0·75	7141	145	0·020	1	5150	145	0·028	1	5150	145	0·028
Intermediate	2	2060	114	0·055	3·5	1089	114	0·105	3·5	1089	114	0·105
Roving	6	601	82	0·136	10	340	82	0·241	12	266	82	0·309
Spinning and general ...	30	645	516	0·800	60	376	516	1·372	80	257	516	2·008
Total wages				**1·175**				**1·910**				**2·614**

Yarn Counts :	90's				100's			
Process	Counts	Production	Wages	Per Lb.	Counts	Production	Wages	Per Lb.
		Lb.	d.	d.		Lb.	d.	d.
Up to drawing	0·25	669	110	0·164	0·25	669	110	0·164
Slubbing	1	5150	145	0·028	1·25	3955	145	0·037
Intermediate	4	927	114	0·123	4·5	801	114	0·142
Roving	14	206	82	0·398	16	168	82	0·489
Spinning and general ...	90	210	516	2·458	100	163	516	3·166
Total wages				**3·171**				**3·998**

Had the wages been apportioned on the basis of mule productions only, the costs would have been as in Table XII.

TABLE XII.

Division of Wages on Basis of Mule Productions Only

Counts	Production per 1000 Spindles	Total Wages per 1000 Spindles	Cost per Lb. in Wages
30's	645lb.	711d.	**1·102d.**
60's	376 ,,	711d.	**1·891d.**
80's	257 ,,	711d.	**2·767d.**
90's	210 ,,	711d.	**3·386d.**
100's	163 ,,	711d.	**4·362d.**

The amount of error in the costs of Table XII. may be seen from Table XIII., showing that in 30's and 100's it amounts to roughly 10 per cent. of the total cost in wages.

TABLE XIII.

Amount of Error if Wages are not Analysed

Counts	30's	60's	80's	90's	100's
Cost on detailed analysis of wages (Table XI.)	1·175	1·910	2·614	3·171	3·998
Cost on basis of production per 1000 mule spindles (Table XII.)	1·102	1·891	2·767	3·386	4·362
Overcosted	—	—	**0·153**	**0·215**	**0·364**
Undercosted	**0·073**	**0·019**	—	—	—

CHAPTER VII

GENERAL EXPENSES

GENERAL expenses in cotton-mill costs embrace all those items of expenditure which are not included under the headings Cotton, Wages, and Discount. They comprise productive expenses, such as oil, leather, coal, ropes, bands, brushes, repairs, gas, water, etc.; establishment expenses, such as taxes, rates, rents, ground rents, insurance, etc.; distributive expenses, such as carriage, packing, skips, cases, etc.; and financial expenses, such as interest and depreciation.

Before these various expenses can be apportioned according to the different counts and qualities spun, the spinner must decide where they shall be obtained. At first thought the figures from the past year's or half-year's trading account will appear to be the only satisfactory basis from which to calculate the apportionment. A moment's consideration, however, will suggest that these figures may be the expenses of an abnormal year, abnormally high or abnormally low, or that the costs of some of the important items may have materially changed since they were extracted, or that charges have there been incurred which will never recur.

The various items of general expenses may be conveniently divided into three groups: (1) Those expenses which are incurred regularly at short intervals, and are fairly constant in price, such as oil, leather, brushes, bands, ground rents, and depreciation where it is a fixed charge; (2) those expenses which are incurred at irregular intervals, or are of varying amount, such as repairs to machinery, painting and pointing of mills, income tax, gas, water, carriage, interest, bank charges, and

salaries or commissions varying with profits; (3) those expenses which have been definitely altered since the last trading account was extracted, and whose amount can be fairly accurately estimated, such as coal (when a new contract has been placed at a different price), depreciation (where it is based on the diminishing value), and interest (where accumulated reserves dispense with the need for borrowed capital).

These three groups of expenditure may be treated differently in order to adjust the trading account of a past year, so as to find a true basis for costing purposes. In group No. 1 the figures of the past trading account will be used, always assuming that it is the account of a full working period, free from short time or strikes; in group No. 2 the average of a number of trading accounts will be used, say of a period of three years, or of whatever other period the spinner thinks is best likely to cover the fluctuations of this group of expenses; in group No. 3 the expenses of the past year or half-year will be increased or reduced according to the estimate of variation due to definite changes of cost.

Suppose, for example, the spinner's expenses are as follows:—

GENERAL EXPENSES

——	1908	1909	1910
	£	£	£
Group No. 1	4.500	4,400	4,600
Group No. 2	3,000	3,100	3,300
Group No. 3	2,500	2,000	2,600
Total	10,000	9,500	10,500

—and it is estimated that group No. 3 in 1911 will be £2500. If for the purpose of costing in 1911 the figures for 1910 are taken, we get £10,500; if the average of the past three years is taken, we get £10,000; but if

the expenses are adjusted as suggested, the figures will be:—

GENERAL EXPENSES

——	1908	1909	1910	1911
	£	£	£	£
Group No. 1 ...	—	—	4,600	4.600
Group No. 2 ...	3,000	3,100	3,300	3,133
Group No. 3 ...	—	—	—	2,500
Total	—	—	—	10,233

Having obtained the total general expenses, it remains to apportion them over the various counts spun. This will be done, as in the case of wages, according to their different productions. As the productions have been stated in pounds per 1000 mule spindles, the expenses must be reduced to the same basis.

Assuming that the above figures of expenditure were for an 80,000-spindle mill, the general expenses per working week would be: £10,233÷50 weeks (*i.e.*, 52 weeks, less 2 weeks for holidays) = £204, 12s.; and the general expenses per 1000 mule spindles per week would be: £204, 12s. ÷ 80 = 614d. Applying this figure to the weekly productions (say the table of productions given on page 28), we get the cost in general expenses per pound of yarn produced, as in Table XIV.:—

TABLE XIV.

Counts	Weekly Production in Lb. per 1000 Spindles	Weekly Expenses in Pence per 1000 Spindles	Expenses in Pence per Lb. Produced
	Lb.	d.	d.
30's	645	614	0·952
40's	571	614	1·075
50's	448	614	1·370
60's	376	614	1·633
70's	318	614	1·931
80's	257	614	2·389
90's	210	614	2·924
100's	163	614	3·767

This method is the apportionment of general expenses on the basis of mule productions, and is only roughly correct owing to the reasons stated in the chapter on "Wages," which also apply here. By this method the whole of the cardroom expenses are apportioned on the basis of mule productions, whilst in counts with varying mule productions the same general expenses are being incurred up to some point in the preparation. Two yarns spun from the same hank roving are incurring exactly the same amount in general expenses up to the mule, whilst in Table XIV. the finer yarn has been allotted more cardroom expenses than the coarser yarn spun from the same hank roving. This causes inaccuracies which will be more in some cases than in others, according to the extent of the range of counts spun, as explained when dealing with the subject of wages. In the case of general expenses, however, the inaccuracy will be greater than in the case of wages, for this reason: cardroom expenses are a higher proportion of total expenses than cardroom wages are of the total wages of the mill. This will be seen from the tables and examples which follow.

The case of each mill must be considered and settled on its own merits, the amount of inaccuracy resulting from the 1000-mule-spindle method determining whether it is desirable further to divide expenses or not.

We will assume, however, that the spinner has decided to analyse expenses according to the different cardroom processes, so as to charge each count of yarn with its proper amount of cardroom expenses. How shall this be done?

It is at once apparent that the total expenses cannot be divided with the same amount of accuracy as the total wages. To say what total wages are incurred in the slubbing process of the cardroom is not a difficult

matter, for they are recorded exactly in the wage-books of the mill, and the only problems they present in costing are the ascertaining of a fair average and the finding of a correct method of apportionment according to productions. But to say exactly what value of oil, strapping, bands, repairs, interest, taxes, etc., is consumed in the slubbing process is impossible; it can only be a matter of estimate. The problem in costing is to make that estimate approach as near to the facts as possible.

But whatever method of the division of expenses for the different processes is employed the basis from which it must begin is the total trading-account expenses of the particular mill concerned. As in all other costing items, so in this, the expenses of one mill are not necessarily any more than a very rough guide in the costing of another.

Starting, then, with the general expenses as recorded in the trading account, we are first to apportion them over the different processes of carding, drawing, roving, etc., and then further to apportion these expenses according to the different productions of the different counts, as shown by the diagram of working (Fig. 4).

Some of the general expenses will not vary at all with the different counts. Of such are cop tubes, carriage, skips and cases; for these charges will be the same per pound for 30's as for 100's counts. It is not suggested, however, that these should be separately dealt with, for they are so small in proportion to the total expenses that the amount of inaccuracy may be ignored. Nor can expenses be accurately apportioned over the different processes if they are divided in the same ratio as wages, for in some departments wages are low relatively to expenses as compared with other departments. The cardroom wages will be roughly one-third of the spinning-

room wages, and yet in interest and depreciation and many other expenses the cardroom will incur a great deal more than one-third of the total expenses of the mill. Some expenses will vary with the power used by the different processes, such as coal, engine packing, driving ropes, etc.; others will vary according to the value of the machinery, such as interest on cost of machinery, depreciation; and some according to the space occupied, such as rates and taxes, gas, interest on cost of buildings, repairs to buildings.

If we study carefully a list of the general expenses of a cotton spinning mill we shall find that the largest items vary roughly as to the value of machinery, or as to the space occupied, about two-thirds of the expenses varying as to value, and about one-third varying as to space. Consider, for instance, the expense of depreciation which will vary as to value of machinery. If there are two processes, one of which has £10,000 worth of machinery, and the other £20,000 worth, it is reasonable to assume that the £20,000 process will cost in depreciation twice as much as the £10,000 process. Or take lighting and heating, which will vary with space occupied. If a process occupies 1000 sq. yds., and another occupies 2000 sq. yds., it is reasonable to assume that the 2000 sq. yds. process will cost in lighting and heating twice as much as the 1000 sq. yds. process. It is suggested, therefore, that in apportioning general expenses over the different processes for the purpose of costing, these two factors should be taken into consideration, two-thirds of the expenses being divided in proportion to the value of the machinery, and one-third in proportion to the space occupied, as in the following examples.

We will assume again a mill of 80,000 mule spindles, spinning from 30's to 100's counts, with the same card-

room counts and productions as those used in the case of wages—*i.e.*, as in Table XV.

TABLE XV.—Counts and Productions

Drawing: In Lb. per Finishing Delivery		Slubbing: In Hanks per Spindle		Intermediate: In Hanks per Spindle		Roving: In Hanks per Spindle		Mule: In Lb. per 1000 Spindles, including Regain.	
Counts	Production	Counts	Production	Counts	Production	Counts	Production	Counts	Production
0·25	650	0·75	52	2	40	6	35	30	645
—	—	1	50	3·5	37	10	33	60	376
—	—	1·25	48	4	36	12	31	80	257
—	—	—	—	4·5	35	14	28	90	210
—	—	—	—	—	—	16	26	100	163

The expenses of the mill amount to £12,500 per annum, which is £250, or 60,000d., per week, 40,000d. varying as to value and 20,000d. as to space. This per 1000 mule spindles per week is $\frac{60{,}000}{80} = 750$d.

The quantity of machinery in the mill, together with the prices, is shown in Table XVI.

TABLE XVI.—Machinery and Prices

1 bale breaker	£80
2 openers	£237, 10s. each
2 scutchers	£100 each
90 cards	£100 each
48 finishing deliveries of draw frames ...	£25 each
580 slubbing spindles	25s. each
2000 intermediate spindles	20s. each
8800 roving spindles	13s. each
80,000 mule spindles	5s. each

The total value of the machinery, and the amount of space occupied, are given in Table XVII.

TABLE XVII.

VALUE OF MACHINERY AND SPACE OCCUPIED

——	Value in £	Space in Sq. Yds.
Bale breaker	80	200
Openers	475	200
Scutchers	200	
Cards	9,000	800
Draw frames	1,200	300
Slubbing frames	725	200
Intermediate frames	2,000	500
Roving frames	5,720	1,400
Mules	20,000	12,000
Total	39,400	15,600

A fairly accurate division of general expenses of the different processes for costing purposes may now be obtained by dividing the total expenses in the ratios of value and space.

For example, 2000 intermediate spindles cost £2000, out of a total machinery value of £39,400, and therefore the expenses varying as to value are $\frac{40{,}000\text{d.} \times 2000}{39{,}400} =$ 2030d. per week. The 2000 intermediate spindles occupy 500 sq. yds. out of a total space occupied by machinery of 15,600 sq. yds., and therefore the expenses varying as to space occupied are $\frac{20{,}000\text{d.} \times 500}{15{,}600} = 641\text{d.}$ per week. This gives the total weekly expenses of the intermediate frames to be 2030d. + 641d. = 2671d.

Following out this method of apportionment for the whole of the processes, we obtain the total expenses for each process, as in Table XVIII.

TABLE XVIII.—Total Expenses of each Process

Process	Value of Machinery in £s	⅔ Expenses, varying as to Value	Apportioned Expenses	Space occupied in Square Yards	⅓ Expenses, varying as to Space	Apportioned Expenses	Total Apportioned Expenses in Pence per Week
	£	d.	d.		d.	d.	d.
To drawing	10,955		11,122	1,500		1,923	13,045
Slubbing ...	725		736	200		257	993
Intermediate	2,000	40,000	2,030	500	20,000	641	2,671
Roving ...	5,720		5,807	1,400		1,795	7,602
Spinning ...	20,000		20,305	12,000		15,384	35,689
	39,400	—	40,000	15,600	—	20,000	60,000

Dividing up these expenses on the same basis as that employed in Table X., we get Table XIX.

TABLE XIX.

Division of Expenses on Production Basis

Process	Machinery (Table XVI.)	Weekly Expenses (Table XVIII.)	Basis
		d.	
To drawing	48 deliveries	13,045	272d. per finishing delivery
Slubbing ...	580 spindles	993	171d. per 100 spindles
Intermediate	2,000 „	2,671	134d. per 100 „
Roving ...	8,800 „	7,602	86d. per 100 „
Spinning ...	80,000 „	35,689	446d. per 1000 „
—	—	60,000	—

These figures may now be applied to the productions of the various counts in order to ascertain the total expenses for each count, as in Table XX. (The productions are worked out in detail in the chapter on " Wages," see p. 47.)

TABLE XX.—Application of Expenses to Productions

Yarn Counts:	30's				60's				80's			
Process	Counts (Table XV.)	Production (Table XL.)	Expenses (Table XIX.)	Per Lb.	Counts	Production	Expenses	Per Lb.	Counts	Production	Expenses	Per Lb.
				d.				d.				d.
To drawing	0·25	669	272	0·407	0·25	669	272	0·407	0·25	669	272	0·407
Slubbing	0·75	7141	171	0·024	1	5150	171	0·033	1	5150	171	0·033
Intermediate	2	2060	134	0·065	3·5	1089	134	0·123	3·5	1089	134	0·123
Roving	6	601	86	0·143	10	340	86	0·253	12	266	86	0·323
Spinning	30	645	446	0·691	60	376	446	1·186	80	257	446	1·735
Total Cost in Expenses				**1·330**				**2·002**				**2·621**

Yarn Counts:	90's				100's			
Process	Counts	Production	Expenses	Per Lb.	Counts	Production	Expenses	Per Lb.
				d.				d.
To drawing	0·25	669	272	0·407	0·25	669	272	0·407
Slubbing	1	5150	171	0·033	1·25	3955	171	0·043
Intermediate	4	927	134	0·145	4·5	801	134	0·167
Roving	14	206	86	0·418	16	168	86	0·512
Spinning	90	210	446	2·124	100	163	446	2·736
Total Cost in Expenses				**3·127**				**3·865**

Had the expenses been apportioned on the basis of mule productions only, the costs and the amount of error would have been as in Table XXI.

TABLE XXI.

AMOUNT OF ERROR IF EXPENSES ARE NOT ANALYSED

Counts	30's	60's	80's	90's	100's
	d.	d.	d.	d.	d.
Cost on detailed analysis of expenses (Table XX.) ...	1·330	2·002	2·621	3·127	3·865
Cost on basis of production per 1000 mule spindles ...	1·163	1·995	2·918	3·571	4·601
Overcosted	—	—	**0·297**	**0·444**	**0·736**
Undercosted	**0·167**	**0·007**	—	—	—

STANDING EXPENSES.—In all mills a large amount of general expenses is incurred whether the mill is working or not. Such charges are interest, rents, taxes, rates, insurance, salaries, and wages of officials. These will have to be paid even if the mill is stopped. With very little trouble it is possible to ascertain from our costing data at what point it ceases to be profitable to spin.

The spinner may be making no profit, or he may even be sustaining a loss, and yet his position may be better than would be the case if he closed his mill and ceased to produce. If he were to shut down he would still incur standing expenses, and he needs some means by which he can ascertain when he has reached the point at which the loss incurred by spinning exceeds the amount of standing expenses which would be incurred by stopping.

Suppose in an 80,000-spindle mill the standing charges are £8000 per annum, made up as in Table XXII.

TABLE XXII.—Amount of Standing Charges

Rates, taxes and rent	£550
Insurance	250
Depreciation	4000
Interest	2000
Salaries and wages	1000
Sundry charges	200
Total	£8000

The standing expenses per annum are £8000, or per week £8000 ÷ 50 (*i.e.*, 52 weeks less 2 weeks holidays) = £160, or per 1000 mule spindles, 480d. per working week. Applying these figures to the table of profits and losses per 1000 spindles (described in the chapter on "Production"), the spinner would be able to see at a glance which counts it would be better to stop producing for the time, and which counts might still be worked to improve his position, as in Table XXIII.

TABLE XXIII.—Standing Expenses

Counts	30's	40's	50's	60's
	d.	d.	d.	d.
Cost	14·83	15·98	16·83	17·50
Selling price	14	15	15·75	16·50
Loss per lb.	0·83	0·98	1·08	1·00
Loss per 1000 spindles	540	558	486	380
Standing expenses per 1000 spindles	480	480	480	480
Advantage of working, per 1000 spindles	—	—	—	**100**
Advantage of stopping, per 1000 spindles	**60**	**78**	**6**	—

According to this table, even with a loss of 1d. per pound, there would still be an advantage in making 60's, over what would result from stopping; in 50's it is immaterial whether the spinner stops or runs; and in 30's and 40's it is decidedly cheaper to stop.

CHAPTER VIII

TWIST AND WEFT YARN COSTS

All our calculations relating to wages and expenses so far have been on the basis of a mill spinning yarn on mules of one gauge of spindles only, either twist or weft. It is therefore correct to assume in such cases that each spindle is consuming the same amount of wages and expenses, for so long as the whole of the spindles are of one gauge they are all working under practically the same conditions, and the whole of the spinning-room wages and expenses may be divided equally amongst them.

But in a great number of cases mills are equipped with both twist and weft spindles. The twist spindles are of $1\frac{1}{4}$ in. gauge or over, and the weft spindles are of $1\frac{1}{8}$ in. gauge or under, the gauge being the distance between the centre of one spindle and the centre of the next spindle.

The twist spindles, therefore, occupy more space than the weft spindles, 1000 twist spindles occupying the same space as about 1200 weft spindles. That being so, it will be at once apparent that it is more expensive to run twist spindles than weft spindles as regards those expenses which vary with the space occupied, such as rents, rates, lighting, cost of buildings, etc.

The twist spindle is also larger, thicker, and stronger than the weft spindle, for it is required to make a cop of about 7 in. in length, as against a cop of about $4\frac{1}{2}$ in. in length made by the weft spindle. This, and the fact that it occupies more space, makes the first cost of the

twist mules greater per spindle than the weft mules, and so raises the costs of interest, depreciation, repairs, etc., above those of weft mules. Then the twist spindle is heavier to drive than the weft spindle, and so its cost in coal, driving ropes, engine charges, etc., is greater than that of the weft spindle.

In the matter of wages also the twist spindle is generally more expensive than the weft spindle, for the "minder" will tend a larger number of weft spindles than of twist spindles, with the addition of perhaps one piecer; the total wages of the pair of mules working out at considerably less per 1000 weft spindles than per 1000 twist spindles.

When, therefore, a mill contains both twist and weft gauge spindles it is incorrect to divide wages and expenses equally over all the spindles. If wages and expenses are apportioned per 1000 spindles, irrespective of whether they are twist or weft spindles, then the twist spindles will be charged with too small an amount of wages and expenses, whilst the weft spindles will be charged with too great an amount. Such an apportionment of wages and expenses would mean that the only difference between the cost of twist and weft yarns of the same counts was the difference due to the greater production of weft yarns over twist yarns. But that is not so, for in addition we know that it costs more to run a twist spindle than a weft spindle,for the reasons just mentioned.

It is desirable in such a mill that separate wages and expenses should be ascertained for twist spindles and for weft spindles. The first step towards this will be the separation of cardroom wages and expenses from spinning-room wages and expenses, for the difference between twist and weft yarns is a matter of spinning-room costs only, and does not extend to the cardroom. It would therefore be incorrect to take the whole of the expenses

of the mill, both cardroom and spinning-room, and to divide them into twist and weft expenses, as for instance, 750d. per 1000 twist spindles, and 650d. per 1000 weft spindles per week, apportioning these over the different counts according to mule productions as in Table XIV. This would be carrying the differentiation between twist and weft yarns into the cardroom, when in that department there is no difference in the working of the two yarns (assuming the same hank roving), and in such a case the twist yarns would be overcosted and the weft yarns would be undercosted.

It is essential, therefore, in determining twist and weft wages and expenses, that cardroom wages and expenses should first be separated from spinning-room wages and expenses. As regards wages, this is a simple matter, for they are recorded separately in the wage-books of the mill, as also are the wages of twist and weft mules.

Suppose, for example, that the spinning-room wages, *i.e.*, the wages of minders, overlookers, etc., are 520d. per 1000 twist spindles, and 470d. per 1000 weft spindles. These wages may now be applied to the productions per 1000 mule spindles as ascertained by the process described in the chapter on "Productions," page 28.

Suppose the productions of twist and weft yarns are as follows:—

TABLE XXIV.—Productions per 1000 Mule Spindles

Counts	50's	60's	70's	80's	90's	100's
Twist productions in lbs. ...	466	375	304	242	207	175
Weft ,, ,, ...	480	393	314	259	219	186

Then the spinning-room wages per lb. of yarn would be as in Table XXV.

TABLE XXV.—Spinning-Room Wages per Lb. of Yarn

Counts	Wages per 1000 spindles	50's	60's	70's	80's	90's	100's
Twist	520	1·116	1·387	1·710	2·149	2·512	2·971
Weft	470	0·979	1·196	1·497	1·815	2·146	2·527

As regards expenses, there is no method of ascertaining from the books how much greater twist expenses are than weft expenses, but of this we are certain, that they are greater, and the majority of them are greater in proportion to the greater amount of space occupied by twist spindles, or in proportion to the greater first cost of twist spindles. It is suggested that the same method of apportionment as has been used in dividing general expenses over the various cardroom processes in Tables XV.–XXI. should be employed here, *i.e.*, the expenses should be apportioned between twist and weft spindles in the ratios of space and value.

Suppose, for example, a mill of 80,000 spindles, of which 40,000 spindles are twist and 40,000 spindles are weft. The mules cost, say, 4s. 6d. per spindle for twist, and 4s. 2d. per spindle for weft; that is, the cost of spinning-room machinery is, twist mules £9000, and weft mules £8333, total £17,333. The total cost of the cardroom machinery is £23,000. The space occupied by the twist mules is 5800 sq. yds., by the weft mules 4720 sq. yds., and by the cardroom machinery 3750 sq. yds.

The total expenses of the mill as ascertained by the method already described in "General Expenses" are £11,750 per annum, which is £235 or 56,400d. per working week. These expenses vary as to two-thirds according to value of machinery, and as to one-third according to space occupied.

Apportioning the expenses according to the method suggested we should obtain:

TABLE XXVI.—Expenses varying as to Space

	Space Occupied	⅓ Expenses varying as to Space	Apportioned Expenses
Cardroom ...	3,750 sq. yds.	18,800d.	4,940d.
Twist Mules ...	5,800 ,,		7,641d.
Weft Mules ...	4,720 ,,		6,219d.
Total ...	14,270 sq. yds.		18,800d.

TABLE XXVII.—Expenses varying as to Value

	Values	⅔ Expenses varying as to Value	Apportioned Expenses
Cardroom ...	£23,000	37,600d.	21,441d.
Twist Mules ...	9,000		8,390d.
Weft Mules ...	8,333		7,769d.
Total ...	£40,333		37,600d.

TABLE XXVIII —Costing Expenses

	Expenses varying as to Space (Table XXVI.)	Expenses varying as to Value (Table XXVII.)	Total	Costing Expenses
Cardroom	4,940d.	21,441d.	26,381d.	26,381d.
Twist Mules	7,641d.	8,390d.	16,031d.	401d. per 1000 spindles
Weft Mules	6,219d.	7,769d.	13,988d.	350d. ,, ,,
	18,800d.	37,600d.	56,400d.	

Applying the costing expenses to the productions of Table XXIV. we obtain the cost in spinning-room expenses as in Table XXIX.

TABLE XXIX.—Spinning-Room Expenses

Counts	Expenses per 1000 Spindles (Table XXVIII.)	50's	60's	70's	80's	90's	100's
Twist ...	401d.	·861d.	1·069	1·319	1·657	1·937	2·291
Weft	350d.	·729d.	0·891	1·115	1·351	1·598	1·882

The total spinning-room costs are as in Table XXX.

TABLE XXX.—Total Spinning-Room Costs per Lb.

Counts	Twist			Weft		
	Wages (Table XXV.)	Expenses (Table XXIX.)	Total	Wages (Table XXV.)	Expenses (Table XXIX.)	Total
	d.	d.	d.	d.	d.	d.
50's	1·116	0·861	1·977	0·979	0·729	1·708
60's	1·387	1·069	2·456	1·196	0·891	2 087
70's	1·710	1·319	3·029	1·497	1·115	2·612
80's	2·149	1·657	3·806	1·815	1·351	3·166
90's	2·512	1·937	4·449	2·146	1·598	3·744
100's	2·971	2·291	5·262	2·527	1·882	4·409

CHAPTER IX

DISCOUNT AND PROFIT

Discount.—We have now dealt with the various items which make up the cost of a carded yarn for the home trade—cotton, waste, wages and general expenses. When the yarn is sold, however, a further item of cost will be incurred, that of discount, which will vary with the price of the yarn, and also with the terms of the market in which the transaction takes place. The amount of discount, however, cannot be charged until we know the selling price of the yarn. As the cost in waste varies with the price of the cotton, so the discount varies with the price of the yarn. 60's twist at 20d. per pound will cost twice as much in discount as 60's twist at 10d. per pound. It would not be strictly correct to base the amount of discount on the cost price of the yarn, for the cost price and the selling price on which discount will have to be allowed to the buyer will probably differ, or at least it is to be hoped so. If therefore we base the discount on the cost price, we shall in the majority of cases be underestimating the amount. So the discount on a yarn which costs 10d. per pound to produce will be more in profitable times than in times of trade depression, owing to the relatively higher price. It is necessary, then, in order to ascertain the discount, to fix an actual or an estimated selling price.

In the Manchester market, where the bulk of the yarn for the home trade is sold, the terms are $2\frac{1}{2}$ per cent.

discount, payment in 14 days. The 14 days' credit has already been charged to the cost of the yarn in the item general expenses, under the heading of bank interest, interest on loans or debentures. Assuming that the selling price of a yarn is 15d., then the cost in discount at $2\frac{1}{2}$ per cent. will be $\frac{15 \times 2{\cdot}5}{100} = 0{\cdot}375$d. per pound. If the yarn has been sold through an agent at a cost of 1 per cent. commission, then the cost in discount and commission would be $\frac{15 \times 3{\cdot}5}{100} = 0{\cdot}525$d. per pound.

For costing purposes a table of discounts specially prepared to cover the prices and conditions of the particular spinner will be of use. He may sell at terms varying from $2\frac{1}{2}$ to 4 per cent., according as to whether or not there is to be added to the usual $2\frac{1}{2}$ per cent.—14 days, agent's commission and guarantee for payment of accounts. A simple specimen table is shown in Table XXXI., covering prices from 12d. to 24d., in advances

TABLE XXXI.—Discounts

Per Cent.	12d.	13d.	14d.	15d.	16d.	17d.	18d.	19d.	20d.	21d.
$2\frac{1}{2}$	0·300	0·325	0·350	0·375	0·400	0·425	0·450	0·475	0·500	0·525
3	0·360	0·390	0·420	0·450	0·480	0 510	0·540	0·570	0·600	0·630
$3\frac{1}{2}$	0·420	0·455	0·490	0·525	0·560	0·595	0·630	0·665	0·700	0·735
4	0·480	0·520	0·560	0·600	0·640	0·680	0·720	0·760	0·800	0·840

Per Cent.	22d.	23d.	24d.	$\frac{1}{8}$d.	$\frac{1}{4}$d.	$\frac{3}{8}$d.	$\frac{1}{2}$d.	$\frac{5}{8}$d.	$\frac{3}{4}$d.	$\frac{7}{8}$d.
$2\frac{1}{2}$	0·550	0·575	0·600	0·003	0·006	0·009	0·012	0·016	0·019	0·022
3	0·660	0·690	0·720	0·004	0·007	0·010	0·015	0·019	0·022	0·025
$3\frac{1}{2}$	0·770	0 805	0·840	0·004	0·009	0·013	0·018	0·022	0·626	0·031
4	0 880	0·920	0·960	0·005	0·010	0·015	0·020	0·025	0·030	0·035

of $\frac{1}{8}$d. per pound, and discount from $2\frac{1}{2}$ to 4 per cent., in advances of $\frac{1}{2}$ per cent. If it is estimated that the selling price of a yarn will be $18\frac{5}{8}$d. per pound, then the discount at $3\frac{1}{2}$ per cent. will be $0{\cdot}63 + 0{\cdot}022 = 0{\cdot}652$d. per pound.

PROFIT.—The addition of discount to the items cotton, waste, wages and expenses, gives us the net cost of the yarn, the price at which it can be sold without either profit or loss. Anything received on sale above that price is profit, anything below it is loss. But the mere statement of the amount received in excess or in defect of the cost per pound for the different counts of yarn contains very little information as to the relative profits or losses of the different counts, as previously explained in the chapter on "Production." A yarn of a higher count will require more profit per pound than a yarn of a lower count, to give the same relative profit. It is desirable, therefore, that the profits per pound of the different counts should be expressed on some basis which shows the relative profit of each. In a private spinning concern this relative profit may be expressed as so much percentage on the capital employed; in a limited liability company it may be expressed as such a percentage of dividend on share capital.

Suppose a concern of 100,000 spindles has a paid-up capital of £50,000, the remainder of the capital employed being either debentures, loans, or bank overdraft. The interest of all the capital employed except share capital will have been already charged in general expenses. To pay a dividend of 5 per cent. on £50,000 will require £2500 per annum, or $\frac{2500}{50}$ = £50 per week, or $\frac{50 \times 240}{100}$ = 120d. per 1000 spindles per week. Applying this amount to the productions per 1000 spindles (say those

given in the chapter on "Production"), we get the amount of profit per pound required to make a 5 per cent. return on each particular count, as in Table XXXII.

TABLE XXXII.—AMOUNT REQUIRED TO MAKE 5 PER CENT. PROFIT ON SHARE CAPITAL

Counts	Production in Lb. per 1000 Spindles	5 per Cent. Profit in Pence per 1000 Spindles	Per Lb. in Pence
30's	645	120	0·186
40's	571	120	0·210
50's	448	120	0·268
60's	376	120	0·319
70's	318	120	0·377
80's	257	120	0·467
90's	210	120	0·571
100's	163	120	0·736

Comparing these figures with the margins between the cost and the selling price obtained we see at a glance the relative profit obtained, or loss incurred, expressed as so much dividend or loss on share capital.

Or the profit may be expressed in pence per 1000 spindles, and compared with the required amount of profit per 1000 spindles, as in Table XXXIII.

[TABLE XXXIII.

TABLE XXXIII.

Counts	30's	40's	50's	60's
Cost per lb., pence	14·190	16·100	16·450	17·120
Selling price, pence	14·500	16·000	16·500	17·500
Profit per lb., pence	0·310	—	0·050	0·380
Loss per lb., pence	—	0·100	—	—
5 per cent. dividend requires (from Table XXXII.)	0·186	0·210	0·268	0·319
Production per 1000 spindles in lb.	645	571	448	376
Profit per 1000 spindles, pence	200	—	22	143
Loss per 1000 spindles, pence	—	57	—	—
5 per cent. dividend requires per 1000 spindles (from Table XXXII.) ...	120	120	120	120

Counts	70's	80's	90's	100's
Cost per lb., pence	18·250	19·760	21·435	23·206
Selling price, pence	18·500	20·000	21·500	23·000
Profit per lb., pence	0·250	0·240	0·065	—
Loss per lb., pence	—	—	—	0·206
5 per cent. dividend requires (from Table XXXII.)	0·377	0·467	0·571	0·736
Production per 1000 spindles in lb.	318	257	210	163
Profit per 1000 spindles, pence	79	62	14	—
Loss per 1000 spindles, pence	—	—	—	34
5 per cent. dividend requires per 1000 spindles (from Table XXXII.) ...	120	120	120	120

CHAPTER X

COMBING

COMBING is an additional process through which some cottons pass in order that they may be made into yarns of a better quality or a finer count than would be practicable without it. By combing, the shorter fibres of cotton and the remaining neps are extracted as comber waste, this waste varying in amount according to the quality of the combed yarn required, more waste being extracted in the better qualities than in the cheaper qualities of combed yarn.

The cotton is presented to the comber in the form of a narrow lap, and so where combing takes place additional preparation machines are required for the making of these comber laps.

In a mill where all the production is combed yarn no special calculation will be required for the purpose of ascertaining the cost of the yarns, for all the expenses of combing will have been included in the ordinary processes of calculation. But in a mill where only part of the production is combed yarn, special treatment of the combed yarns will be necessary in order to separate them from those yarns which pass through only the ordinary carded yarn processes.

The increased cost due to combing will include: (*a*) The cost of the extra waste extracted, less the amount received for that waste on sale; (*b*) the cost in wages of the additional workpeople, and the additional supervision required; (*c*) the cost in expenses of the working of the extra machines and the occupation of the extra space.

(*a*) Cost in waste, less amount received for waste: This item has already been dealt with under the heading "Cotton and Waste," and will have been allowed for in the cotton and waste constant for the particular combed yarn considered.

(*b*) Wages: This item will include the wages of sliver-lap machine tenters, ribbon-lap machine tenters, comber tenters, and also the wages of supervision. Suppose these wages amount to 12s. per comber per week, and the production per comber in yarn is—(650lb. sliver, less say 2 per cent. after comber waste, plus 5 per cent. regain); or—

$$\frac{650 \times 103}{100} = 670\text{lb. yarn};$$

then the wages cost of combing per pound of yarn is

$$\frac{144\text{d.}}{670} = 0{\cdot}22\text{d.}$$

If there are different combed preparations which are each being subjected to different treatment, then the wages will be divided according to their different productions.

(*c*) Expenses: These will be apportioned according to the method previously explained in the chapter on "General Expenses." Suppose the value of and space occupied by the whole of the machinery in a mill to be £40,000 and 16,000 sq. yds. respectively. The value of and space occupied by each comber and its preparation machinery we will assume to be £210 and 20 sq. yds. respectively. If the general expenses of the mill amount to £250, or 60,000d., per week, then the general expenses per comber and preparation are:—

$$\frac{40{,}000\text{d.} \times 210}{40{,}000} = 210\text{d. value expenses.}$$

$$\frac{20{,}000\text{d.} \times 20}{16{,}000} = 25\text{d. space expenses.}$$

$$210\text{d.} + 25\text{d.} = 235\text{d. per week.}$$

Applying this figure to the production of 670lb. per comber per week, then the cost in general expenses is $\frac{235d.}{670lbs.}$ = ·35d. per pound of yarn produced. These costs of wages and expenses may now be added to the other costs of the yarn. Example:—

	Per Lb. Yarn d.
Cost of cotton (including cotton lost at comber) ...	20·80
Amount received for waste (including comber waste)	1·32
Net cost in cotton	19·48
Wages	4·85
Expenses	4·40
Extra wages for combing	0·22
Extra expenses for combing	0·35
	29·30
Discount	0·75
Cost of yarn	30·05

If, however, it is desired for comparative purposes to ascertain the cost of combing alone, then the cost in waste and the amount received for waste must be dealt with separately, as in the following example:—

Cotton at 12d per pound. Received for comber waste, 6d. per pound. Carded waste, 18 per cent. Comber waste, 20 per cent.

	Lb.
Cotton	100
Carded waste	18
	82
20 per cent. comber waste	16·4
	65·6
5 per cent. regain	3·28
Yarn produced	68·88

Cost in comber waste, 16·41lb. at 6d. per lb. (*i.e.*, cotton, 12d.; less received for waste, 6d.) = 98·4d., or per pound of yarn produced, 98·4 ÷ 68·88 = 1·43d.

Taking the wages and expenses to be as before, then the total cost of combing in this particular case is—

	Per Lb. of Yarn
Waste, less amount received for same	1·43d.
Wages	0·22
Expenses	0·35
Total	2·00d.

It will be readily seen that the cost of combing will vary very considerably in different mills, according to the following factors: (1) The price of the cotton used; (2) the price of comber waste sold; (3) the amount of waste extracted by the comber; (4) the production of the comber.

If the cotton were to be double combed with 20 and 12 per cent. at the two combing processes, other factors being as in the above case, we should get the following example:—

Cotton	100lb.
Carded waste	18
	82
1st comber, 20 per cent.	16·4
	65·6
2nd comber, 12 per cent.	7·87
	57·73
Regain, 5 per cent.	2·89
Yarn produced	60·62lb.

—and the cost in waste would be 24·27lb. of waste at

6d. per pound = 145·62d., or per pound of yarn produced, $\frac{145{\cdot}62}{60{\cdot}62}$ = 2·40d. Then the total cost of double combing in this particular case is—

Waste, less amount received	2·40d.
Wages (say)...	0·44
Expenses (say)	0·74
Total cost per pound of yarn	3·58d.

It is sometimes argued that the extra pre-combing wages and expenses incurred through combing should be added into the cost of combing. If the comber takes out 20 per cent. of waste, then 20 per cent. of cotton which will not become yarn has incurred the wages and expenses of mixing, opening, scutching and carding. Suppose that in a carded yarn 115lb. of cotton is required to produce 100lb. of yarn, whilst if the same class of cotton is combed 135lb. of cotton will be required to produce 100lb. of yarn. Then 20lb. more cotton has been mixed, opened, and carded in the case of the combed yarn than in the case of the carded yarn for the same weight of yarn. At first thought it appears that this should be taken into consideration, but in the average combed yarn these costs are so small as to be practically a negligible quantity. The wages up to the card will be about 0·1d. per pound of yarn produced, whilst the expenses may reach 0·3d. per pound. 20lb. of cotton, therefore, would cost in wages and expenses 20 (0·1 + 0·3) = 8d. for 100lb. of yarn, or per lb. of yarn $\frac{8}{100}$ = 0·08d., being about $\frac{1}{16}$d. per pound. Considering that combed yarns are those with the highest costs, this amount would be very small in relation to the total cost of yarn. Not only so, but in all probability the extra wages and expenses will have been already apportioned

over the whole of the production in the ordinary process of apportioning carded costs, and therefore to take note of them in combing costs would be to charge them twice. As a matter of correct theoretical working, however, the cost is incurred, and may be added.

CHAPTER XI

EXPORT TRADE COSTS

We have assumed so far that the yarns with whose costs we are dealing are for the home trade, and subject to the usual home-trade terms as to credit and discount. But if in addition to his ordinary home trade the spinner does an export trade in which he deals direct with the foreign user on what are known as "Franco" terms, special calculations will be necessary in order to ascertain the cost of these yarns. Of course, a great amount of yarn for export is sold upon ordinary home-trade terms to large shipping houses, who themselves do the actual exporting. In these cases the spinner is not concerned as to the additional costs of exporting the yarn; his price is quoted on Manchester terms, and it is immaterial to him whether the yarn is for export or not.

But if the spinner deals directly with foreign customers he will probably be required to quote his price in the currency of the country in which his customer resides, and also to quote a price which includes all the expenses incidental to the transporting of the goods to a foreign country, including railway carriage, sea freight, insurance, and import duty, where there is such a duty on yarns. In short, he will be asked to deliver the yarn at his customer's door free from all charges, which charges will therefore have to be included in the price of the yarn. These are "Franco" terms.

In the case of a spinner doing a large export trade in addition to a home trade, it is desirable that the export charges should be kept in a separate impersonal ledger

account, so that in ascertaining the general expenses for ordinary home-trade costing purposes these foreign charges may be easily excluded. Otherwise they will be spread over the whole of the yarn produced, whether exported or not, so showing an abnormally high amount of general expenses for home-trade yarns. If, however, they are separated from the ordinary trade items, then the general expenses will be those of producing a home-trade yarn only, and the basis of the foreign calculations will be the price quoted for the home-trade yarns. For example:—

EXPORT TRADE EXPENSES ACCOUNT

Dr.		*Cr.*	
1910.		1910.	
Mar.—To shipping charges, etc.	£325	Dec.—By trade account ...	£1,300
June— ,, ..	426		
Sept.— ,, ,,	342		
Dec.— ,, ,,	207		
	£1,300		£1,300

NET HOME TRADE GENERAL EXPENSES FOR 1910

Total general expenses from trading account ...	£12,000
Less export trade expenses as above	1,300
General expenses for home-trade costs ...	£10,700

Commencing, then, with the home-trade price ascertained in the ordinary way of costing, it is necessary to calculate the amount to be added in order to quote "Franco"—*i.e.*, all charges paid to destination—terms. The additional charges will consist of—

(*a*) Import duty.
(*b*) Exporting agent's charges, including railway rates, sea freight, insurance, etc.
(*c*) Packing.
(*d*) Difference in discount from home-trade terms.
(*e*) Difference in credit from home-trade terms.

(*a*) *Import Duty.*—The largest item of expenditure

in exporting yarn to Continental countries is import duty, which varies with the different countries, and also with the different counts of yarn. The import duties on grey, single, cotton yarns, of the more important Continental countries to which yarn is exported from Lancashire—Germany, France, Switzerland and Austria-Hungary—are as shown in Tables XXXIV. to XXXVII.

TABLE XXXIV.—GERMANY

IMPORT DUTIES ON GREY, SINGLE, COTTON YARNS

Counts	Marks per 100 kilogs.
Up to 11's English	6
Over 11's and up to 17's	8
,, 17's ,, 22's	11
,, 22's ,, 32's	14
,, 32's ,, 47's	18
,, 47's ,, 63's	22
,, 63's ,, 83's	25
,, 83's ,, 102's	28
,, 102's English	40

TABLE XXXV.—FRANCE

IMPORT DUTIES ON GREY, SINGLE, COTTON YARNS

Counts, Measuring to the Kilogramme	Francs per 100 kilogs.
31,000 metres or less	15·00
Above 31,000 metres to 41,000 metres ...	18·50
,, 41,000 ,, 51,000 ,, ...	22·00
,, 51,000 ,, 61,000 ,, ...	28·00
,, 61,000 ,, 71,000 ,, ...	35·00
,, 71,000 ,, 81,000 ,, ...	40·00
,, 81,000 ,, 91,000 ,, ...	45·00
,, 91,000 ,, 101,000 ,, ...	50·00
,, 101,000 ,, 121,000 ,, ...	60·00
,, 121,000 ,, 141,000 ,, ...	70·00
,, 141,000 ,, 161,000 ,, ...	80·00
,, 161,000 ,, 181,000 ,, ...	95·00
,, 181,000 ,, 201,000 ,, ...	110·00
,, 201,000 ,, 221,000 ,, ...	130·00
,, 221,000 ,, 241,000 ,, ...	150·00
,, 241,000 ,, 261,000 ,, ...	180·00
,, 261,000 ,, 281,000 ,, ...	210·00
,, 281,000 ,, 341,000 ,, ...	260·00
,, 341,000 ,, 381,000 ,, ...	310·00
,, 381,000 ,, — ,, ...	340·00

TABLE XXXVI.—SWITZERLAND

IMPORT DUTIES ON GREY, SINGLE, COTTON YARNS

Counts	Francs per 100kilogs.
Up to and including 19's English	16
20's to 119's inclusive	20
120's and above	7

TABLE XXXVII.—AUSTRIA-HUNGARY

IMPORT DUTIES ON GREY, SINGLE, COTTON YARNS

Counts	Kronen per 100kilogs.
Up to 12's English	14
Over 12's to 29's	19
,, 29's ,, 50's	33
,, 50's ,, 70's	38
,, 70's ,, 80's	43
,, 80's ,, 90's	33
,, 90's ,, 110's	28
,, 110's	Free

It will be noticed that the duties on the same count of yarn are widely different in these four countries; not only so, but the general policy of the tariffs is different in each case. Germany has a tariff which rises gradually in amount as the counts rise up to 102's counts, over which all counts are taxed at the same rate. France also has a tariff rising in the same way, but the graduation goes on up to 225's counts, above which all the counts bear the same duty. The French tariff is also much higher than the German tariff up to 102's, being about twice the German; and whilst the highest German duty is about 2d. per pound, the highest French duty is about 15d. per pound. The Swiss tariff contains only three items, and in this case the finest counts of yarn bear the least amount of duty, whilst the yarns from 20's to 119's counts are taxed an equal amount per pound. The Austrian tariff rises with the counts up to 80's, and then

falls as the counts rise up to 110's, all counts above which are duty free.

To be of service to the spinner these various tariffs require conversion into pence per pound. Let us take for an example the German tariff. The duty on 80's counts is 25 marks per 100kilogs. Then the duty per pound weight in pence will be—

$$\frac{\text{Marks per 100kilogs.} \times \text{pence in £1,}}{\text{100kilogs.} \times \text{lb. per kilog.} \times \text{marks per £1}}$$

as

$$\frac{25 \times 240}{100 \times 2{\cdot}205 \times 20{\cdot}40} = 1{\cdot}33\text{d. per lb. of 80's counts.}$$

Converting the various tariffs in this way we get:—

TABLE XXXVIII.—GERMANY

Counts	Marks per 100kilogs.	Pence per Lb.
Up to 11's English	6	0·32
Over 11's up to 17's	8	0·43
,, 17's ,, 22's	11	0·59
,, 22's ,, 32's	14	0·75
,, 32's ,, 47's	18	0·96
,, 47's ,, 63's	22	1·18
,, 63's ,, 83's	25	1·33
,, 83's ,, 102's	28	1·50
,, 102's	40	2·13

[TABLE XXXIX.

TABLE XXXIX.—FRANCE

Counts	Francs per 100kilogs.	Pence per Lb.
Up to 18's English	15	0·65
Over 18's up to 24's	18·50	0·80
,, 24's ,, 30's	22	0·95
,, 30's ,, 36's	28	1·21
,, 36's ,, 42's	35	1·51
,, 42's ,, 48's	40	1·73
,, 48's ,, 54's	45	1·94
,, 54's ,, 60's	50	2·16
,, 60's ,, 72's	60	2·59
,, 72's ,, 83's	70	3·02
,, 83's ,, 95's	80	3·45
,, 95's ,, 107's	95	4·10
,, 107's ,, 119's	110	4·75
,, 119's ,, 130's	130	5·61
,, 130's ,, 142's	150	6·48
,, 142's ,, 154's	180	7·77
,, 154's ,, 166's	210	9·07
,, 166's ,, 201's	260	11·23
,, 201's ,, 225's	310	13·39
,, 225's ...	340	14·69

TABLE XL.—SWITZERLAND

Counts	Francs per 100kilogs.	Pence per Lb.
Up to 19's English	16	0·81
20's to 119's inclusive	20	1·02
120's and above	7	0·36

TABLE XLI.—AUSTRIA-HUNGARY

Counts	Kronen per 100kilogs.	Pence per Lb.
Up to 12's English	14	0·63
Over 12's up to 29's	19	0·86
,, 29's ,, 50's	33	1·50
,, 50's ,, 70's	38	1·72
,, 70's ,, 80's	43	1·95
,, 80's ,, 90's	33	1·50
,, 90's ,, 110's	28	1·27
,, 110's ...	Free	Nil

(*b*) *Exporting Agent's Charges, including Railway Carriage, Sea Freight, Insurance, etc.*—These charges will of course vary according to the destination of the yarn and the town in this country from which it is sent. The spinner will have lists of charges issued by the various forwarding agents who undertake the care of yarn shipped abroad, and who quote through rates from towns in this country to towns abroad. These through rates will cover English railway charges to the port of shipment, sea freight to the Continent, and railway charges from Continental port to destination.

Suppose, for instance, that a Manchester spinner is sending yarn to the Baden district of Germany, the through rates to which will vary from about 8 francs per 100kilogs. to about 9·50 francs per 100kilogs., according to the situation of the particular town to which the yarn has to be sent. Then the cost per pound of yarn for this item of expenditure at, say, 9 francs per 100kilogs., would be—

$$\frac{\text{Through rate per 100kilogs.} \times \text{pence per £1}}{(\text{100kilogs.} - \text{14kilogs. legal tare}) \times \text{lb. per kilog.} \times \text{francs per £}}$$

as

$$\frac{9 \times 240}{86 \times 2{\cdot}205 \times 25{\cdot}20} = 0{\cdot}46\text{d per pound ;}$$

or, to use a constant number—

$$\frac{240}{86 \times 2{\cdot}205 \times 25{\cdot}2} = \frac{1}{19{\cdot}9} \text{ constant number,}$$

and therefore the through rate in francs per 100kilogs. $\div 19{\cdot}9$ = the cost per pound in pence for through rate.

If the through rate to Germany is quoted in marks, then the constant number will be—

$$\frac{240}{86 \times 2{\cdot}205 \times 20{\cdot}40} = \frac{1}{16{\cdot}12} \text{ constant number,}$$

and the through rate in marks per 100kilogs. ÷ 16·12 = cost per pound in pence for through rate.

In addition to these charges for through rate there will be other small charges, such as insurance, custom-house fees, etc. The amount of insurance will vary with the value of the yarn; but not being a heavy charge, it may be put down, together with the sundry other small charges, at a constant figure of, say, 0·03d. per pound for coarse counts, 0·05d. per pound for medium counts, and 0·07d. per pound for fine counts.

(*c*) *Packing.*—In the home trade, yarns are delivered in the spinner's own cases or skips, which are returned to him when empty, and are in constant use. In the case of the export trade, however, the return of these empties would be too expensive, and so yarn is generally exported in light shipping cases which are not returnable. These cases, therefore, constitute an additional charge over the home-trade costs, and must be taken into account. If it is the spinner's custom to ship in 500lb. cases, these will cost about 6s. each, and the cost per pound of yarn in packing cases will be—

$$\frac{72}{500} = 0{\cdot}14\text{d. per pound.}$$

(*d*) *Difference in Discount or Commission.* — The ordinary home-trade terms are less $2\frac{1}{2}$ per cent. discount. If the spinner sells abroad on terms which allow a different rate of discount, as is often the case, the difference must be taken into consideration in fixing the foreign price. These discounts will vary with the different foreign markets. Suppose the price is quoted subject to 3 per cent. discount. This means that he allows $\frac{1}{2}$ per cent. more than he would allow on Manchester terms. The amount of the gain or loss in discount cannot be ascertained until the price of the yarn is fixed,

and therefore it is desirable that the spinner should prepare a list of discounts to suit his own particular terms and range of prices.

Table XLII. shows a specimen discount list, ranging from 12d. to 20d. per pound in price, and from $\frac{1}{2}$ to $2\frac{1}{2}$ per cent. discount.

TABLE XLII.—Foreign Discounts.

Price in Pence	$\frac{1}{2}$ per Cent.	1 per Cent.	$1\frac{1}{2}$ per Cent.	2 per Cent.	$2\frac{1}{2}$ per Cent.
12	0·060	0·120	0·180	0·240	0·300
13	0·065	0·130	0·195	0·260	0·325
14	0·070	0·140	0·210	0·280	0·350
15	0·075	0·150	0·225	0·300	0·375
16	0·080	0·160	0·240	0·320	0·400
17	0·085	0·170	0·255	0·340	0·425
18	0·090	0·180	0·270	0·360	0·450
19	0·095	0·190	0·285	0·380	0·475
20	0·100	0·200	0·300	0·400	0·500
$\frac{1}{8}$	0·001	0·001	0·002	0·003	0·003
$\frac{1}{4}$	0·001	0·003	0·004	0·005	0·006
$\frac{3}{8}$	0 002	0·004	0·006	0·008	0·009
$\frac{1}{2}$	0·003	0·005	0·007	0·010	0·013
$\frac{5}{8}$	0·003	0·006	0·009	0·013	0·016
$\frac{3}{4}$	0·004	0·008	0·011	0·015	0·019
$\frac{7}{8}$	0·004	0·009	0·013	0·018	0·022

(*e*) *Difference in Credit.*—The amount of credit allowed in Manchester terms is fourteen days. It is the common custom to give much longer credit in the export trade. It is probable that this arose in order to enable the customer to receive and examine the yarn before payment, which in the case of a short credit would be impossible. Credit of from thirty to sixty days may be allowed, according to the market in which the yarn is sold, and this is from sixteen to forty-six days in excess of that allowed in the home trade. The spinner will

therefore have to add the cost of this credit to his home-trade price, in order to quote his customer on the same basis. The cost of the credit, like that of the discount, will vary with the price of the yarn. Assuming that the extra credit allowed in the particular foreign district dealt in is thirty-one days at 5 per cent. interest, then the list of credit costs for the different prices of yarn is as in Table XLIII.

TABLE XLIII.

THIRTY-ONE DAYS' CREDIT AT 5 PER CENT. INTEREST

Price per pound .	12d.	13d.	14d.	15d.	16d.	17d.	18d.	19d.	20d.
Credit per pound .	0·051	0·055	0·059	0·064	0·068	0·072	0·076	0·080	0·084
Price per pound .	$\frac{1}{8}$d.	$\frac{1}{4}$d.	$\frac{3}{8}$d.	$\frac{1}{2}$d.	$\frac{5}{8}$d.	$\frac{3}{4}$d.	$\frac{7}{8}$d.	—	—
Credit per pound .	0·001	0·001	0·002	0·002	0·003	0·003	0·004	—	—

CHAPTER XII

EXPORT TRADE COSTS (*continued*)

HAVING ascertained the various items of export costs, we are now in a position to make out the foreign cost lists.

Take the case of Germany. The amount of duty per pound of yarn of the various counts is shown in Table XXXVIII. The through rate charges at, say, 8 francs per 100kilogs. amount to $\frac{8\text{fcs.}}{19{\cdot}9\text{ (constant)}} = 0{\cdot}40\text{d.}$ per pound. Thus for Germany a list of the fixed exporting charges which are incurred, irrespective of the variations in price of yarn, is as in Table XLIV.

TABLE XLIV.—FIXED EXPORT CHARGES FOR GERMANY

Counts.	Duty (Table XXXVIII.)	Through Rate, say 8fcs.	Insurance, Etc.	Packing	Total per Lb.
	d.	d.	d.	d.	d.
Up to 11's	0·32	0·40	0·03	0·14	**0·89**
Over 11's to 17's	0·43	0·40	0·03	0·14	**1·00**
,, 17's ,, 22's	0·59	0·40	0·03	0·14	**1·16**
,, 22's ,, 32's	0·75	0·40	0·03	0·14	**1·32**
,, 32's ,, 47's	0·96	0·40	0·03	0·14	**1·53**
,, 47's ,, 63's	1·18	0·40	0·05	0·14	**1·77**
,, 63's ,, 83's	1·33	0·40	0·05	0·14	**1·92**
,, 83's ,,102's	1·50	0·40	0·05	0·14	**2·09**
,, 102's	2·13	0·40	0·05	0·14	**2·72**

The fixed charges for other countries are as given in Tables XLV. to XLVII.

TABLE XLV.—Fixed Export Charges for Austria-Hungary

Counts.	Duty (Table XLI.)	Through Rate, say 11fcs.	Insurance, Etc.	Packing	Total per Lb.
	d.	d.	d.	d.	d.
Up to 12's	0·63	0·55	0·03	0·14	1·35
Over 12's to 29's	0·86	0·55	0·03	0·14	1·58
,, 29's ,, 50's	1·50	0·55	0·03	0·14	2·22
,, 50's ,, 70's	1·72	0·55	0·05	0·14	2·46
,, 70's ,, 80's	1·95	0·55	0·05	0·14	2·69
,, 80's ,, 90's	1·50	0·55	0·05	0·14	2·24
,, 90's ,,110's	1·27	0·55	0·05	0·14	2·01
,, 110's	Nil	0·55	0·05	0·14	0·74

TABLE XLVI.—Fixed Export Charges for France

Counts	Duty (Table XXXIX.)	Through Rate, say 8fcs.	Insurance, Etc.	Packing	Total per Lb.
	d.	d.	d.	d.	d.
Up to 18's	0·65	0·40	0·03	0·14	1·22
Over 18's to 24's	0·80	0·40	0·03	0·14	1·37
,, 24's ,, 30's	0·95	0·40	0·03	0·14	1·52
,, 30's ,, 36's	1·21	0·40	0·03	0·14	1·78
,, 36's ,, 42's	1·51	0·40	0·03	0·14	2·08
,, 42's ,, 48's	1·73	0·40	0·03	0·14	2·30
,, 48's ,, 54's	1·94	0·40	0·05	0·14	2·53
,, 54's ,, 60's	2·16	0·40	0·05	0·14	2·75
,, 60's ,, 72's	2·59	0·40	0·05	0·14	3·18
,, 72's ,, 83's	3·02	0·40	0·05	0·14	3·61
,, 83's ,, 95's	3·45	0·40	0·05	0·14	4·04
,, 95's ,, 107's	4·10	0·40	0 05	0·14	4·69
,, 107's ,, 119's	4·75	0·40	0·05	0·14	5·34
,, 119's ,, 130's	5·61	0·40	0·07	0·14	6·22
,, 130's ,, 142's	6·48	0·40	0·07	0·14	7·09
,, 142's ,, 154's	7·77	0·40	0·07	0·14	8·38
,, 154's ,, 166's	9·07	0·40	0·07	0·14	9·68
,, 166's ,, 201's	11·23	0·40	0·07	0·14	11·84
,, 201's ,, 225's	13·39	0·40	0·07	0·14	14·00
,, 225's	14·69	0·40	0·07	0·14	15·30

TABLE XLVII.—Fixed Export Charges for Switzerland

Counts.	Duty (Table XL.)	Through Rate, say 10fcs.	Insurance, Etc.	Packing	Total per Lb.
	d.	d.	d.	d.	d.
Up to 19's	0·81	0·51	0·03	0·14	1·49
Over 19's to 119's	1·02	0·51	0·05	0·14	1·72
,, 119's	0·36	0·51	0·05	0·14	1·06

Suppose now it is desired to ascertain the cost of 60's counts delivered Franco terms in Germany, which counts the spinner quotes at, say, 15d. per pound, home-trade terms. Then we get:—

Home-trade price	15d. per lb.
Fixed charges (Table XLIV.)	1·77d.
Excess discount, say ½ per cent. (Table XLII.)	0·085d.
Excess credit at, say, 17d. (Table XLIII.) ...	0·072d.
Cost, Franco terms in Germany	16·927d.

Examples of Calculations for Other Countries.—In each case the credit is taken at 31 days at 5 per cent. merely for the purpose of illustration from Table XLIII. It is understood that both the credit and the discount will vary with the different countries and markets:—

France

Home-trade price, 60's	15d. per lb.
Fixed charges (Table XLVI.)	2·75d.
Excess discount (Table XLII.)	0·090d.
Excess credit at, say, 18d. (Table XLIII.) ...	0·076d.
Cost, Franco terms in France	17·916d.

Austria-Hungary

Home-trade price, 60's	15d. per lb.
Fixed charges (Table XLV.)	2·46d.
Excess discount (Table XLII.)	0·090d.
Excess credit at, say, 18d. (Table XLIII.) ...	0·076d.
Cost, Franco terms in Austria-Hungary ...	17·626d.

Switzerland

Home-trade price, 60's	15d. per lb.
Fixed charges (Table XLVII.)	1·72d.
Excess discount (Table XLII.)	0·085d.
Excess credit at, say, 17d. (Table XLIII.) ...	0·072d.
Cost, Franco terms in Switzerland	16·877d.

Conversion.—It is now necessary to convert these prices into foreign currency. This will be done in actual practice by the employment of a constant number which, when applied to the English price per pound, gives the price per kilogramme in foreign currency. Take the German currency, which nominally is 20·40 marks to the English sovereign. It is desirable that the spinner should base his calculations on a rather higher rate of exchange than 20·40 in order to avoid losses due to the fluctuations of exchange. Though the nominal rate of exchange between the German currency and the English currency is 20·40 marks per £1, this rate fluctuates within certain narrow limits, according to the conditions of international trade. It may sometimes rise to 20·50 marks, or it may fall to 20·30 marks. Now, if the spinner converts his English price into German currency at 20·40 marks, which means that for every sovereign's worth of yarn he will receive from his foreign customer payment of 20·40 marks, and if, when he is paid, the rate of exchange has moved to, say, 20·48 marks, he will lose 8 pf. per £1 on the exchange, for instead of getting £1 for each 20·40 marks as he calculated, he will get only 19s. 11d. If the calculations are based on an exchange of say 20·50 marks, this figure will safeguard the spinner against all reasonable fluctuations in the rate of exchange.

Then if the English price per pound with charges added is 16d., the price in marks per kilogramme will be—

$$\frac{16\text{d.} \times 2{\cdot}205\text{lb. per kilog.} \times 20{\cdot}50 \text{ marks per £1}}{240\text{d. per £1}}$$

$$= 3{\cdot}01 \text{ marks per kilog.}$$

If the conversion is from marks per kilogramme to pence per pound, then—

$$\frac{3{\cdot}01 \text{ marks per kilog.} \times 240\text{d. per £1}}{2{\cdot}205\text{lb. per kilog.} \times 20{\cdot}50 \text{ marks per £1}} = 16\text{d. per pound,}$$

or, to use a constant number—

$$\frac{240}{2{\cdot}205 \times 20{\cdot}50} = 5{\cdot}3 \text{ constant number,}$$

and the marks per kilog. × constant number = pence per pound, as—

$$3{\cdot}01 \times 5{\cdot}3 = 15{\cdot}95, \text{ say } 16\text{d. per pound.}$$

The price in pence per pound ÷ the constant number = the marks per kilogramme, as—

$$\frac{16}{5{\cdot}3} = 3{\cdot}01 \text{ marks per kilogramme.}$$

For the French and Swiss currencies the constant number would be—

$$\frac{240}{2{\cdot}205 \times 25{\cdot}30} = 4{\cdot}3 \text{ constant number,}$$

and the francs per kilogramme × the constant number = pence per pound, whilst the pence per pound ÷ constant number = francs per kilogramme.

For the Austrian currency the constant would be—

$$\frac{240}{2{\cdot}205 \times 24{\cdot}10} = 4{\cdot}51 \text{ constant number,}$$

and the kronen per kilogramme × the constant number = the pence per pound, and the pence per pound ÷ the constant number = the kronen per kilogramme.

In order to facilitate these conversions it is desirable that in the case of spinners with a large foreign trade, tables should be constructed which show at a glance the price in foreign currency, including exporting charges, of any count at any price. All that is then needed in quoting is to find the home-trade price in the table, and to read off at once the foreign price, Franco terms.

Specimen tables for the four Continental countries already mentioned are set out in Tables XLVIII. to LI.

TABLE XLVIII.—Conversion Table: France

25's to 30's		31's to 35's		37's to 42's		43's to 48's		49's to 54's		55's to 60's		61's to 72's		73's to 83's	
Fixed Charges, 1·52d. per Lb.		Fixed Charges, 1·78d. per Lb.		Fixed Charges, 2·08d. per Lb.		Fixed Charges, 2·30d. per Lb.		Fixed Charges, 2·53d. per Lb.		Fixed Charges, 2·75d. per Lb.		Fixed Charges, 3·18d. per Lb.		Fixed Charges, 3·61d. per Lb.	
Pence per Lb. Home Trade	Francs per Kilog., Franco, France	Pence per Lb. Home Trade	Francs per Kilog., Franco, France	Pence per Lb. Home Trade	Francs per Kilog., Franco, France	Pence per Lb. Home Trade	Francs per Kilog., Franco, France	Pence per Lb. Home Trade	Francs per Kilog., Franco, France	Pence per Lb. Home Trade	Francs per Kilog., Franco, France	Pence per Lb. Home Trade	Francs per Kilog., Franco, France	Pence per Lb. Home Trade	Francs per Kilog., Franco, France
8	2·25	8	2·33	9	2·61	9	2·67	10	2·96	12	3·48	14	4·05	16	4·63
9	2·48	9	2·56	10	2·84	10	2·90	11	3·19	13	3·72	15	4·28	17	4·86
10	2·72	10	2·80	11	3·08	11	3·14	12	3·43	14	3·95	16	4·52	18	5·10
11	2·96	11	3·04	12	3·32	12	3·37	13	3·66	15	4·19	17	4·76	19	5·34
12	3·19	12	3·27	13	3·56	13	3·61	14	3·90	16	4·43	18	4·99	20	5·57
13	3·43	13	3·51	14	3·79	14	3·84	15	4·14	17	4·66	19	5·23	21	5·81
14	3·67	14	3·75	15	4·03	15	4·08	16	4·37	18	4·90	20	5·47	22	6·04
15	3·90	15	3·98	16	4·26	16	4·32	17	4·61	19	5·14	21	5·71	23	6·28
16	4·14	16	4·21	17	4·50	17	4·55	18	4·84	20	5·37	22	5·94	24	6·51
17	4·37	17	4·45	18	4·74	18	4·79	19	5·08	21	5·60	23	6·18	25	6·75
18	4·61	18	4·69	19	4·97	19	5·03	20	5·31	22	5·84	24	6·42	26	6·99
19	4·84	19	4·92	20	5·21	20	5·26	21	5·55	23	6·07	25	6·65	27	7·22

TABLE XLIX.—Conversion Table : Germany

Up to 11's		12's to 17's		18's to 22's		23's to 32's		33's to 47's		48's to 63's		64's to 83's		84's to 102's		Over 102's	
Fixed Charges, 0·89d. per Lb.		Fixed Charges, 1·00d. per Lb.		Fixed Charges, 1·16d. per Lb.		Fixed Charges, 1·32d. per Lb.		Fixed Charges, 1·53d. per Lb.		Fixed Charges, 1·77d. per Lb.		Fixed Charges, 1·92d. per Lb.		Fixed Charges, 2·09d. per Lb.		Fixed Charges, 2·72d. per Lb.	
Pence per Lb. Home Trade	Marks per Kilog., Franco, Germany	Pence per Lb. Home Trade	Marks per Kilog., Franco, Germany	Pence per Lb. Home Trade	Marks per Kilog., Franco, Germany	Pence per Lb. Home Trade	Marks per Kilog., Franco, Germany	Pence per Lb. Home Trade	Marks per Kilog., Franco, Germany	Pence per Lb. Home Trade	Marks per Kilog., Franco, Germany	Pence per Lb. Home Trade	Marks per Kilog., Franco, Germany	Pence per Lb. Home Trade	Marks per Kilog., Franco, Germany	Pence per Lb., Home Trade	Marks per Kilog., Franco, Germany
5	1·13	6	1·34	7	1·56	8	1·78	9	2·02	10	2·25	13	2·86	15	3·27	17	3·77
6	1·32	7	1·54	8	1·75	9	1·98	10	2·21	11	2·45	14	3·05	16	3·46	18	3·97
7	1·51	8	1·73	9	1·95	10	2·17	11	2·40	12	2·64	15	3·24	17	3·66	19	4·16
8	1·70	9	1·92	10	2·14	11	2·36	12	2·59	13	2·83	16	3·43	18	3·85	20	4·35
9	1·89	10	2·11	11	2·33	12	2·55	13	2·78	14	3·02	17	3·62	19	4·04	21	4·54
10	2·08	11	2·30	12	2·52	13	2·74	14	2·97	15	3·21	18	3·81	20	4·23	22	4·73
11	2·28	12	2·49	13	2·71	14	2·93	15	3·16	16	3·41	19	4·00	21	4·42	23	4·92
12	2·47	13	2·68	14	2·90	15	3·12	16	3·36	17	3·60	20	4·19	22	4·61	24	5·11
13	2·66	14	2·87	15	3·10	16	3·32	17	3·55	18	3·79	21	4·38	23	4·80	25	5·30
14	2·85	15	3·06	16	3·29	17	3·51	18	3·74	19	3·98	22	4·57	24	4·99	26	5·49
15	3·04	16	3·25	17	3·48	18	3·70	19	3·93	20	4·17	23	4·77	25	5·18	27	5·68
16	3·23	17	3·44	18	3·67	19	3·89	20	4·12	21	4·36	24	4·96	26	5·37	28	5·88

TABLE L.—Conversion Table: Austria-Hungary

Up to 12's		13's to 29's		30's to 50's		51's to 70's		71's to 80's		81's to 90's		91's to 110's		Over 110's	
Fixed Charges, 1·35d. per Lb.		Fixed Charges, 1·58d. per Lb.		Fixed Charges, 2·22d. per Lb.		Fixed Charges, 2·46d. per Lb.		Fixed Charges, 2·69d. per Lb.		Fixed Charges, 2·24d. per Lb.		Fixed Charges, 2·01d. per Lb.		Fixed Charges, 0·74d. per Lb.	
Pence per Lb. Home Trade	Kronen per Kilog., Franco, Austria	Pence per Lb. Home Trade	Kronen per Kilog., Franco, Austria	Pence per Lb. Home Trade	Kronen per Kilog., Franco, Austria	Pence per Lb. Home Trade	Kronen per Kilog., Franco, Austria	Pence per Lb. Home Trade	Kronen per Kilog., Franco, Austria	Pence per Lb. Home Trade	Kronen per Kilog., Franco, Austria	Pence per Lb. Home Trade	Kronen per Kilog., Franco, Austria	Pence per Lb. Home Trade	Kronen per Kilog., Franco, Austria
6	1·65	7	1·93	9	2·52	12	3·25	15	3·98	16	4·10	17	4·27	18	4·21
7	1·88	8	2·16	10	2·75	13	3·48	16	4·20	17	4·33	18	4·50	19	4·44
8	2·10	9	2·38	11	2·97	14	3·70	17	4·43	18	4·55	19	4·72	20	4·66
9	2·33	10	2·61	12	3·20	15	3·93	18	4·65	19	4·77	20	4·95	21	4·89
10	2·55	11	2·83	13	3·42	16	4·15	19	4·87	20	5·00	21	5·17	22	5·11
11	2·77	12	3·05	14	3·65	17	4·38	20	5·10	21	5·22	22	5·40	23	5·34
12	3·00	13	3·28	15	3·87	18	4·60	21	5·32	22	5·45	23	5·62	24	5·56
13	3·22	14	3·50	16	4·10	19	4·83	22	5·55	23	5·67	24	5·85	25	5·79
14	3·45	15	3·73	17	4·32	20	5·05	23	5·77	24	5·90	25	6·07	26	6·01
15	3·68	16	3·95	18	4·55	21	5·28	24	6·00	25	6·12	26	6·30	27	6·24
16	3·90	17	4·17	19	4·77	22	5·50	25	6·22	26	6·34	27	6·52	28	6·46
17	4·13	18	4·40	20	5·00	23	5·73	26	6·45	27	6·57	28	6·75	29	6·69

TABLE. LI.—Conversion Table: Switzerland.

Up to 19's		20's to 119's		Over 119's	
Fixed Charges, 1·49d. per Lb.		Fixed Charges, 1·72d. per Lb.		Fixed Charges 1 06d. per Lb.	
Pence per Lb. Home Trade	Fcs. per Kilog., Franco, Switzerland	Pence per Lb. Home Trade	Fcs. per Kilog., Franco, Switzerland	Pence per Lb. Home Trade	Fcs. per Kilog., Franco, Switzerland
8	2·24	10	2·77	18	4·50
9	2·47	12	3·24	19	4·73
10	2·71	14	3·72	20	4·97
11	2·95	16	4·19	21	5·21
12	3·18	18	4·66	22	5·44
13	3·42	20	5·13	23	5·68
14	3·66	22	5·60	24	5·92
15	3·89	24	6·07	25	6·15
16	4·13	26	6·54	26	6·39
17	4·37	28	7·01	27	6·62
18	4·60	30	7·48	28	6·86
19	4·84	32	7·96	29	7·09
20	5·08	34	8·43	30	7·33
21	5·31	36	8·90	31	7·56

CHAPTER XIII

DIAGRAMS

We have seen that comparative costs enable us to compare the working of a concern in one period with its working in another period. But these comparative costs can be studied only at the *end* of the period to which they relate, and therefore they do not show the changes in margins and profits *which are taking place*, but only those *which have taken place*.

But whilst the spinner must wait until the end of his financial year or half-year before he can obtain the actual facts as to his working, that is no reason why he should not have before him from week to week some more definite knowledge of his position than that contained in such vague ideas as "Trade is improving"; "Margins are better"; or, "Things go from bad to worse," and so on.

It is desirable that there should be some system of recording costs which will indicate from week to week, or even from day to day, the rise or fall in margins and profits. Such a system should, as far as is possible, show the position of affairs at a glance, without the necessity of searching amongst a mass of data; and it should also show the position of each short period in relation to other short periods—that is, it should be progressive.

The most satisfactory method of recording these

figures is by means of a diagram. If we take any series of figures and examine them, we shall find that it is practically impossible to fully grasp their significance—how they fluctuate, or what is their trend; but if we record the same figures by means of a diagram, they at once become intelligible, and convey to the mind information which when placed in a column it is impossible to understand fully. So if the spinner records for 52 weeks the margin on a certain class of yarn by means of a column of figures, it will convey to him far less information than would the same figures when plotted on squared paper.

Now, what records will be of most use to the spinner in conveying to him a fairly correct idea of his progress? They will, of course, vary with the different classes of trade, and with the requirements of particular mills. But in all cases a useful diagram will be one which shows from week to week the variations in the margin of one or more standard counts and qualities of yarn. Suppose the spinner's standard count is 60's, Egyptian quality, and that he has fairly regular sales of this yarn. From his sales of 60's he will fix an average price each week. Or he may reduce all the counts sold in that particular quality to the basis of 60's, by adding or deducting the difference in price between them and the standard count to or from the prices obtained for them. Therefore, if the spinner sells 70's at $20\frac{1}{4}$d. per pound, and his recognized difference between 60's and 70's of the same quality is $1\frac{1}{2}$d. per pound, then this is equal to a sale of 60's at $18\frac{3}{4}$d. per pound, and will be reckoned as such for the purpose of fixing the average selling price of the standard count 60's.

But the statement in a diagram of the mere variations in the price of yarn will not convey much information, for a rise or fall in the price of yarn may not mean a rise

or fall in the amount of margin; it may be accounted for by a rise or fall in the price of raw cotton. So if in May the price of 60's is 13d. with cotton at 8d. per pound, and in August it has risen to 16d. with cotton at 12d., the spinner's margin will have decreased, and should be recorded in a diagram of margins by a fall in the curve.

Neither will the mere difference between the prices of cotton and yarn show the margin which the spinner wishes to know; for it is quite possible to have a diminishing margin alongside an increasing difference between the prices of cotton and yarn. We have already seen that if cotton rises in price the cost of production rises also, because the cost in waste is more on a high-priced cotton than on a low-priced cotton. So with a cotton constant of 1·2, if the price of cotton is 8d. per pound, the cost in cotton per pound of yarn is 9·6d., or 1·6d. above the price of cotton; whilst if cotton is 12d. per pound, the cost of cotton per pound of yarn is 14·4d., or 2·4d. above the price of cotton.

The only margin which is of interest to the spinner is the margin between the net cost of cotton per pound of yarn produced, and the net price of yarn. All other things, such as wages and expenses, being equal, a rise or fall in this margin is equivalent to a rise or fall in the profit per pound of yarn.

The spinner will then first record the price of his sales of the standard count, and also the purchase price or the broker's quotation of the cotton required to make that standard count. He will then ascertain from the cotton price, and from the waste and regain amounts—*i.e.*, from the cotton and waste constant—the cost of cotton per pound of yarn produced. Then by deducting from the price of yarn the cost of discount there will be obtained the net price of yarn. The difference between

these two figures will be the margin on that particular standard count, and will be recorded in a diagram.

EXAMPLE.—*May* 20: 60's sold at 17d. per pound, less $2\frac{1}{2}$ per cent. discount. Cotton quoted at 12d. per pound. Cotton constant 1·2. Waste sold at average price of 3d. per pound. Then the margin is—

Yarn 17d., *less* $2\frac{1}{2}$ per cent. discount		16·575d.
Cotton 12d. × 1·2	14·4d.	
Less waste	0·610	
		13·790
Margin		2·785d.

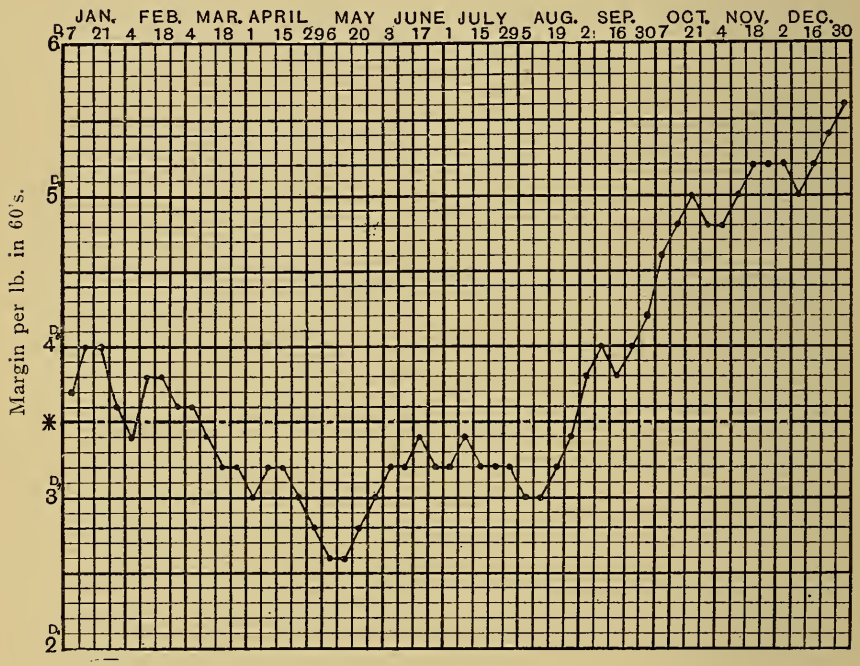
August 12: 60's sold at $14\frac{3}{4}$d. per pound, less $2\frac{1}{2}$ per cent. discount. Cotton quoted at 10d. Cotton constant 1·2. Waste sold at average price of 3d. per pound. Then the margin is—

Yarn $14\frac{3}{4}$d., *less* $2\frac{1}{2}$ per cent. discount		14·382d.
Cotton 10d. × 1·2	12·0d.	
Less waste	0·610	
		11·390
Margin		2·992d.

In this particular example, although from May to August there is a fall of $\frac{1}{4}$d. per pound in the difference between the prices of cotton and yarn, there is an increase of $\frac{1}{4}$d. per pound in the true margin.

Working out the figures each week in this way we obtain the average weekly margins, which may be recorded in a diagram as in Fig. 5, showing at a glance the trend of trade in that particular count and quality. If the spinner prefers to record the estimated profit per pound rather than the margin, he will each week deduct from the margin the estimated cost of wages and expenses; or he may do the same thing in another way by recording in the margin diagram the cost of wages and

expenses as in Fig. 5, the difference between the two lines showing the estimated profit or loss per pound. If more qualities than one are made, then a separate diagram will be required to record the trend of margins of the standard count in each quality.


JAN. FEB. MAR. APRIL MAY JUNE JULY AUG. SEP. OCT. NOV. DEC.
D 7 21 4 18 4 18 1 15 29 6 20 3 17 1 15 29 5 19 2 16 30 7 21 4 18 2 16 30
6
D 5
D 4
*
D 3
D 2
Margin per lb. in 60's.

Margin.
*Margin required to cover Cost, without Profit.

FIG. 5
Margins on Yarn sold.

But such a diagram as Fig. 5, whilst it will show correctly the rise or fall in margins or profits per pound of yarn, will only be a rough indicator of the spinner's total profits or losses. It may be that the largest weights of yarn are sold when the margins are lowest, as in the first half of the year, as shown in Fig. 5, and that the smallest weights of yarn only are sold when the

margins are highest, as in the second half of the year, as shown in Fig. 5. The high margins, therefore, may only apply to a very small proportion of the spinner's total production, whilst the low margins may be the margins obtained on a very large weight of yarn. We cannot say, therefore, from Fig. 5 alone that the total profit in, say, December is three times the total profit in September, for in December the spinner may be delivering the yarn sold in large quantities in September at the lower margin; and in December he may be able to sell only a very small weight. So the special circumstances of the cotton and yarn markets may conspire to lessen the importance of the information to be obtained from Fig. 5.

In order to give a correct idea of total profits or losses, therefore, this diagram would require adjustment according to the weights of yarn sold and delivered at these particular margins. But rather than do this it is simpler to prepare an entirely new diagram. Substituting for the average price of yarn on the day the average price of yarn delivered, and for the average quoted price of cotton the average price of cotton used, we obtain a new margin, which may be very different from the margin shown in Fig. 5, and it is this margin which governs the spinner's total profits or losses. The average price of yarn delivered will be obtained by dividing the total value of yarn delivered by the total weight delivered, and the average price of cotton used will be obtained by dividing the total value of cotton used by the total weight used.

Various methods of recording these margins will suggest themselves. The average margin may be reduced to the margin on a standard count, in which case the rise or fall in the curve will mean the rise or fall in the margin; or the average margin recorded may be the margin of

varying average counts, changing from week to week, in which case the curve of margins must be qualified by the curve of average counts delivered, for in such a diagram a rise in margin may be due to a rise in the average counts delivered, and may not represent a true increase of margin.

The latter method is illustrated in Fig. 6, the difference

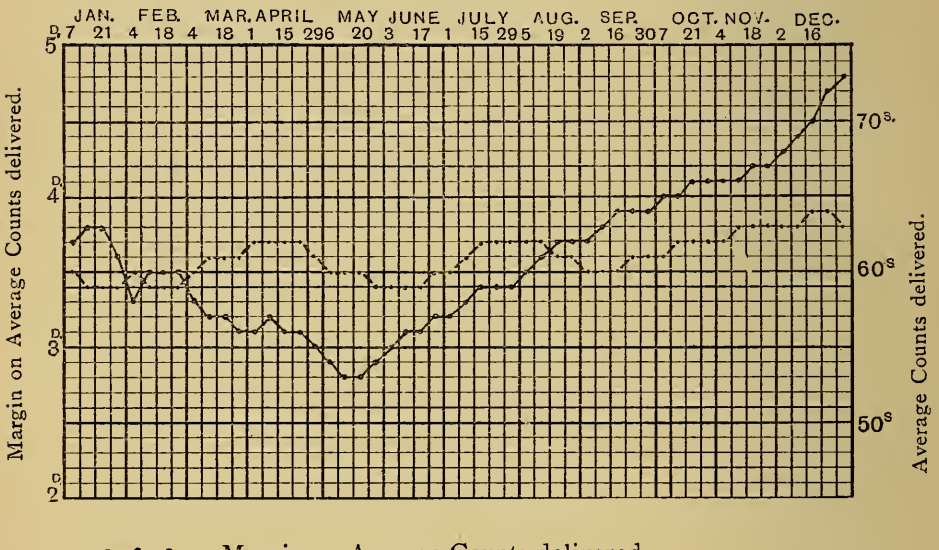

JAN. FEB. MAR. APRIL MAY JUNE JULY AUG. SEP. OCT. NOV. DEC.
5 7 21 4 18 4 18 1 15 29 6 20 3 17 1 15 29 5 19 2 16 30 7 21 4 18 2 16
5
D 4
D 3
C 2
70s.
60s
50s
Margin on Average Counts delivered.
Average Counts delivered.
Margin on Average Counts delivered.
Average Counts delivered.

FIG. 6
Margins on Yarn delivered.

between the two lines representing the profit above or loss below the margin required for the different counts. In such a diagram it is essential that the relationship between counts and margins should be correct—that is to say, if 10 counts is equal to one penny of margin, all other things being equal, then the space of 10 counts in the vertical scale of counts must equal the space of one penny in the vertical scale of margins; otherwise the impression given by the diagram will be a false one.

Fig. 6 is self-explanatory, it being understood that the line for 60's counts is the same as the line for 60's margin required without profit—*i.e.*, say 3·5d. per pound—and that a rise of 10 counts requires a rise of 1d. margin. Then the difference between the two curves indicates the rise or fall in margins and profits.

But even this diagram must not be read as if it contained the truth, the whole truth, and nothing but the truth; for there are many factors which may temporarily upset its value. If the spinner is spinning partly to stock, or delivering partly from stock, the average price of yarn delivered may not be the correct figure from which to calculate the margin. For instance, 60's counts may be spun to stock at a cost of 18d. per pound, and some time later may be delivered at 16d. per pound. If cotton has fallen 2d. per pound in the meantime, and the spinner's average price of cotton used has fallen 2d. per pound, the margin in Fig. 6 will show no decline so far as the yarn delivered from stock is concerned, whilst actually there is a loss of 2d. per pound on every pound of stock yarn which has been sold, unless the loss has been covered in some other way, such as by a sale of futures.

The diagram in Fig. 6 then works satisfactorily so long as all the yarn spun is being sent away; but if stocking or delivering from stock takes place, little errors inevitably creep in which may destroy its whole value. Such diagrams then,—and in fact all estimates of profits based on similar reasoning—are to be read with caution, and should always be studied in relation to all the other facts of working. Whilst they may be made extremely useful, it should be remembered that the only absolutely reliable statement of profit is that obtained by correctly taking stock, and extracting a trading account.

CHAPTER XIV

SPECIMEN COSTING SYSTEM

HAVING dealt with the various items of cost, it remains to apply what has been stated to a specimen system of accounts; analysing the working of a past period for comparative costs, and extracting from them and from particulars of present working a table of costs of the various counts produced. The following system, it is hoped, will be found to be self-explanatory.

SPECIMEN ACCOUNTS.—The Imaginary Spinning Company, Limited, works a mill of 80,000 spindles, contained in 40 pairs of mules of 1000 spindles per mule. The share capital of the company is £60,000, all of which is paid up.

TABLE LII.—TRADING ACCOUNT FOR THE YEAR 1911

To cotton used	£102,707	14	8	2,240,896lb.
,, wages	12,800	0	0	
,, expenses	1,500	0	0	
,, profit	5,520	5	5	
Regain, *less* invisible loss	...	...		28,011
	£132,528	0	1	2,268,907lb.
By yarn produced	£129,166	13	4	2,000,000lb.
,, waste produced ...	3,361	6	9	268,907
	£132,528	0	1	2,268,907lb.

TABLE LIII.—AMOUNT OF WASTE PRODUCED IN 1911 AS A PERCENTAGE ON WEIGHT OF COTTON USED

			Percentage on Cotton Used
Cotton used (Table LII.)		2,240,896lb.	100
Yarn spun	1,904,762lb.	—	85
Waste produced (Table LII.)	268,907	2,173,669	12
Invisible loss		67,227lb.	3

TABLE LIV.—Amount of Regain in 1911 as a Percentage on Yarn Spun

		Percentage on Yarn Spun
Yarn produced (Table LII.)	2,000,000lb.	105
Yarn spun (Table LIII.)	1,904,762	100
Regain	95,238lb.	5

TABLE LV.—Trading Account Analysis of Costs per Pound of Yarn Produced in 1911 (Weight and Values from Table LII.)

		Per Lb. of Yarn Produced
Cotton used	£102,707 14 8	12·325d.
Wages	12,800 0 0	1·536
Expenses	11,500 0 0	1·380
Profit	5,520 5 5	0·662
	£132,528 0 1	15·903d.
2,000,000lb. yarn produced ..	£129,166 13 4	15·500d.
Waste produced	3,361 6 9	0·403
	£132,528 0 1	15·903d.

TABLE LVI.

Present Counts, Hank Rovings, Productions, and Price of Cotton

Counts of yarn	40's	42's	44's	50's	54's	60's
Lb. spun per pair of mules per week	1350	1250	1150	940	880	760
Hank rovings	8	8	8	10	10	10
Hanks produced per roving spindle per week ...	36	36	36	34	34	34
Price of cotton used ...	11¼d.	11¼d.	11¼d.	11½d.	11½d.	11½d.

N.B.—All the cotton is treated alike up to the roving frame.

TABLE LVII.

MULE PRODUCTIONS PER 1000 SPINDLES FOR COSTING PURPOSES

Counts (Table LVI.)	Mule Productions (Table LVI.)	Per 1000 Spindles	Less 1o/o Breakages	Plus 5o/o Regain (Table LIV.)
40's	1350	675	668	701
42's	1250	625	619	650
44's	1150	575	569	597
50's	940	470	465	488
54's	880	440	436	458
60's	760	380	376	395

TABLE LVIII.

ROVING FRAME PRODUCTIONS FOR COSTING PURPOSES

Counts (Table LVI.)	Hanks per Spindle per Week (Table LVI.)	Lbs. per 100 Spindles per Week (including Allowances for Waste and Regain)
8-hank	36	463
10-hank	34	350

TABLE LIX.

QUANTITIES OF MACHINERY, VALUES, AND SPACE

Machinery	Quantity	Value	Sq. Yds. of Space
Bale breaker	1	£80	
Openers	2	475	
Scutchers	2	200	
Cards	90	9,000	2,200
Draw frames (deliveries)	48	1,200	
Slubbing spindles	580	725	
Inter spindles	2,000	2,000	
Roving spindles	10,500	6,820	1,700
Mule spindles	80,000	20,000	12,000
Total	—	£40,500	15,900

TABLE LX.

Division of Wages Based on Figures of 1911

(*a*)

Cardroom wages up to roving frames		£40
Roving frame wages		40
Spinning-room and general wages		176
Total (from Table LII.) $\frac{£12,800}{50}$ = ...		£256

(*b*)

—	Weekly Wages (Table *a*)	Pence	Apportioned Wages
Wages up to roving frames	£40	9,600	9600d. per whole production
Roving frame wages	40	9,600	91d. per 100 spindles
Spinning and general wages	176	42,240	528d. per 1000 spindles
Total ...	£256	61,440	768d. per 1000 spindles

TABLE LXI.

Apportionment of Wages per Lb. of Yarn Produced

(*a*)

Wages up to Roving Frame

Weekly wages (Table LX. (*b*)) ... 9,600d.

Weekly production of yarn ... 40,000lb. = 0·24d. per pound of yarn produced.

(*b*)

Wages of Roving Frames

Hank Roving	Production (Table LVIII.)	Wages (Table LX.(*b*))	Per Lb. of Yarn Produced
	Lb.	d.	d.
8	463	91	0·197
10	350	91	0·260

(*c*)

Wages of Spinning and General Wages

Counts	Production (Table LVII.)	Wages (Table LX. (*b*).)	Per Lb. of Yarn Produced
	Lb.	d.	d.
40's	701	528	0·753
42's	650	528	0·812
44's	597	528	0·885
50's	488	528	1·082
54's	458	528	1·153
60's	395	528	1·337

(*d*)

Total Wages.

Counts	Hank Roving	Wages to Roving (Table LXI. (*a*))	Wages of Roving (Table LXI. (*b*))	Wages of Spinning (Table LXI. (*c*))	Total Wages per Lb. of Yarn Produced.
		d.	d.	d.	d.
40's	8	0·240	0·197	0·753	1·190
42's	8	0 240	0 197	0·812	1·249
44 s	8	0·240	0·197	0·885	1·322
50's	10	0·240	0·260	1·082	1·582
54's	10	0·240	0·260	1·153	1·653
60's	10	0·240	0·260	1·337	1·837

TABLE LXII.

ESTIMATED GENERAL EXPENSES FOR 1912

(*a*)

——	1909	1910	1911	1912
Group 1	—	—	£3,920	£3,920
,, 2	£4,400	4,600	4,200	4,400
,, 3	—	—	—	3,200
				£11,520

(*b*)

$\frac{£11,520}{50}$ = £230, 4s. per week = 55,296d. total expenses per week.

$\frac{2}{3}$ Total expenses, varying as to value of machinery = 36,864d.
$\frac{1}{3}$ Total expenses, varying as to space occupied = 18,432

55,296d.

TABLE LXIII.

Division of General Expenses over Different Processes

(*a*)

Process	Values (Table LIX.)	Total Expenses varying as to Value (Table LXII. (*b*))	Apportioned Expenses varying as to Value.	Space (Table LIX.)	Total Expenses varying as to Space (Table LXII. (*b*))	Apportioned Expenses varying as to Space
	£	d.	d.		d.	d.
To Roving	13,680	36,864	12,452	2,200	18,432	2,550
Roving ...	6,820		6,208	1,700		1,971
Spinning	20,000		18.204	12,000		13.911
Total ...	40,500	—	36,864	15,900 sq. yds	—	18,432

(*b*)

Process	Value Expenses (Table LXIII. (*a*))	Space Expenses (Table LXIII. (*a*))	Total Expenses	Costing Expenses
	d.	d.	d.	
To Roving...	12,452	2,550	15, 0 02	15,002d. per total production
Roving ...	6,208	1,971	8,179	78d. per 100 spindles
Spinning ...	18,204	13,911	32,115	401d. per 1000 spindles
Total ...	36,864	18,432	55,296	—

TABLE LXIV.

Apportionment of General Expenses per Pound of Yarn Produced

(*a*)

Expenses up to Roving Frame

Weekly expenses up to roving frame (Table LXIII. (*b*)) ... 15,002d.

Weekly production of yarn ... ... 40,000lbs.

=0·375d. per lb. of yarn produced

(*b*)

Expenses of Roving

Hank Roving	Production (Table LVIII.)	Expenses (Table LXIII. (*b*))	Per Lb. of Yarn Produced
	Lb.	d.	d.
8	463	78	0·169
10	350	78	0·223

(*c*)

Expenses of Spinning

Counts	Productions (Table LVII.)	Expenses (Table LXIII. (*b*))	Per Lb. of Yarn Produced
	Lb.	d.	d.
40's	701	401	0·572
42's	650	401	0·617
44's	597	401	0·672
50's	488	401	0·822
54's	458	401	0·876
60's	395	401	1·015

(*d*)

Total Expenses

Counts	To Roving (Table LXIV. (*a*))	Roving (Table LXIV. (*b*))	Spinning (Table LXIV. (*c*))	Total Expenses per Lb. of Yarn Produced
	d.	d.	d.	d.
40's	0·375	0·169	0·572	1·116
42's	0·375	0·169	0·617	1·161
44's	0·375	0·169	0·672	1·216
50's	0·375	0·223	0·822	1·420
54's	0·375	0·223	0·876	1·474
60's	0·375	0·223	1·015	1·613

TABLE LXV.

Calculation for Cotton and Waste Constant

Cotton used	100lb.
Waste loss (Table LIII.)	15lb.
Yarn spun	85lb.
Regain (Table LIV.) 5 per cent.	4·25lb.
Yarn produced	89·25lb.

If 100lb. cotton produces 89·25lb. yarn, then—

$$\frac{100 \times 100}{89{\cdot}25} = 1{\cdot}12\text{lb. cotton required to produce 1lb. yarn.}$$

TABLE LXVI.—Amount Received for Waste

Value of waste produced in 1911 (Table LII.), £3361, 6s. 9d.

Weight of waste produced in 1911 (Table LII.), 268,907lb.

Therefore, $\frac{\text{£3361, 6s. 9d.}}{268{,}907} = 3\text{d. per pound received on sale of waste.}$

For 89·25lb. of yarn produced (Table LXV), 12lb. of waste is sold (Table LIII.).

Therefore the amount received for waste per pound of yarn produced is $\frac{12\text{lb.} \times 3\text{d.}}{89{\cdot}25\text{lb.}} = 0{\cdot}403\text{d.}$ (Table LV.).

TABLE LXVII.—$2\frac{1}{2}$ PER CENT. DISCOUNT

Selling price	15d.	$15\frac{1}{4}$d.	$15\frac{1}{2}$d.	16d.	$16\frac{1}{4}$d	17d.
Discount .	0·375d.	0·381d.	0·387d.	0·400d.	0·412d.	0·425d.

TABLE LXVIII.

AMOUNT OF 5 PER CENT. DIVIDEND

£60,000 share capital at 5 per cent. dividend = £3000 per annum. $\frac{3000}{50}$ = £60 per week, $\frac{60 \times 240}{80}$ = 180d. per 1000 spindles per week.

TABLE LXIX.

AMOUNT OF PROFIT PER POUND OF YARN REQUIRED TO MAKE 5 PER CENT. DIVIDEND

Counts	Production (Table LVII.)	5 per cent. Dividend Requires (Table LXVIII.)	Per Pound of Yarn Produced
	Lb.	d.	d.
40's	701	180	0·257
42's	650	180	0·277
44's	597	180	0·302
50's	488	180	0·369
54's	458	180	0·393
60's	395	180	0·456

[TABLE LXX.

TABLE LXX.—Complete Costs

Counts ...	40's	42's	44's	50's	54's	60's
Price per pound of cotton (Table LVI.)	11·25	11·25	11·25	11·5	11·5	11·5
Cotton and waste constant (Table LXV.)	1·12	1·12	1·12	1·12	1·12	1·12
Cost in cotton per pound of yarn produced	12·600	12·600	12·600	12·880	12·880	12·880
Received for waste (Table LXVI.)	0·403	0·403	0·403	0·403	0·403	0·403
Net cost in cotton	12·197	12·197	12·197	12·477	12·477	12·477
Wages (Table LXI.(*d*))	1·190	1·249	1·322	1·582	1·653	1·837
General expenses (Table LXIV.(*d*))	1·116	1·161	1·216	1·420	1·474	1·613
Cost to produce	14·503	14·607	14·735	15·479	15 604	15·927
2½ per cent. discount on estimated selling price (Table LXVII.)	0·375	0·381	0·387	0·400	0·412	0·425
Net cost of yarn	14·878	14·988	15·122	15·879	16·016	16·352
Estimated selling price	15	15·25	15·5	16	16·5	17

TABLE LXXI.—Relative Profits

Counts ...	40's	42's	44's	50's	54's	60's
Net cost of yarn (Table LXX.)	14·878	14·988	15·122	15·879	16·016	16·352
Selling price (Table LXX.)	15·000	15·250	15·500	16·000	16·500	17·000
Profit per pound	0·122	0·262	0·378	0·121	0·484	0·648
5 per cent. dividend requires (Table LXIX)	0·257	0·277	0·302	0·369	0·393	0·456
Production per 1000 spindles, in pounds	701	650	597	488	458	395
Profit per 1000 spindles, pence	86	170	226	59	222	256
5 per cent. dividend requires per 1000 spindles (Table LXVIII.), pence	180	180	180	180	180	180

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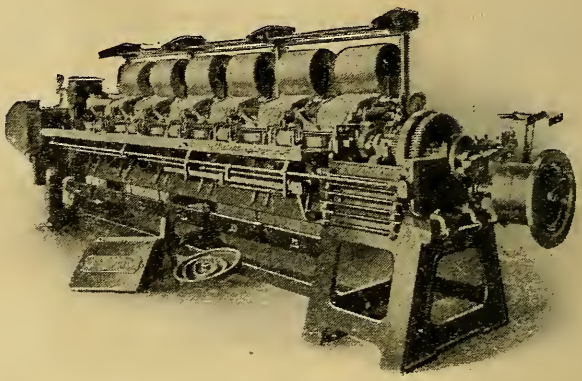

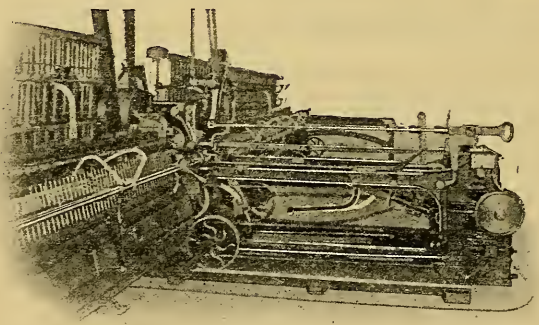

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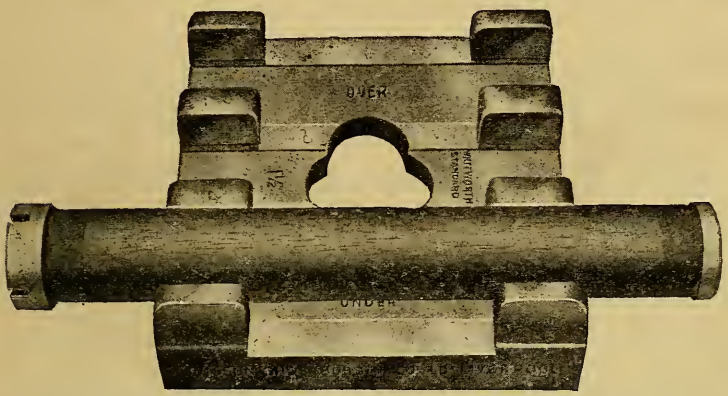

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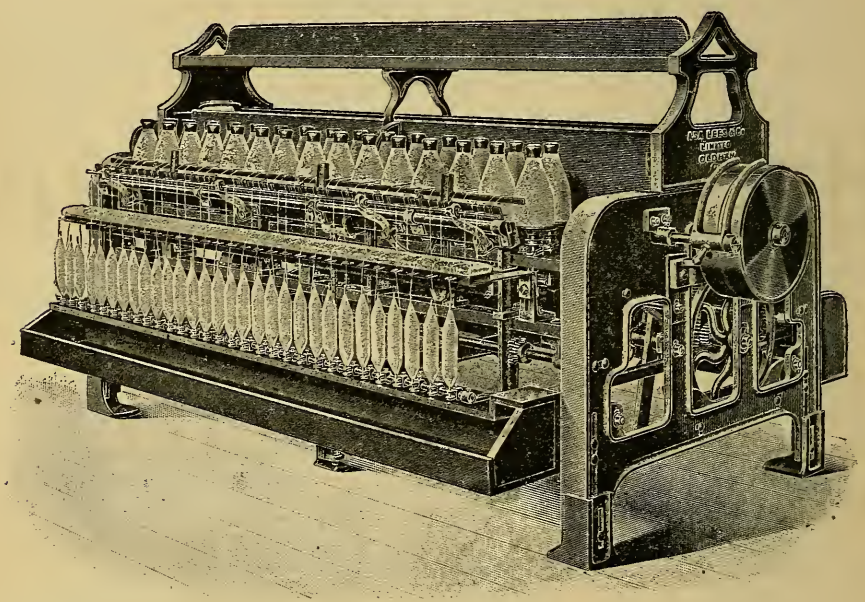

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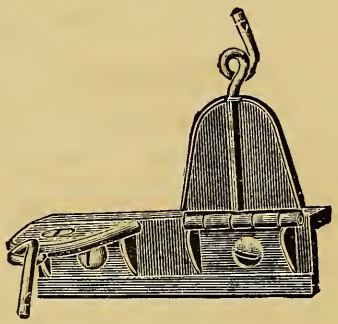

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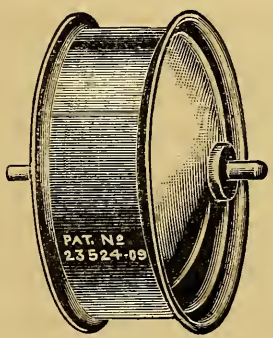

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